W. G. FARLOW

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INDEX

OF THE

Mycological Writings

—OF—

C. G. LLOYD.

VOL. I,

1898-1905.

CINCINNATI, OHIO, U. S. A.

CONTENTS.

(Binding is advised in this order).

INDEX.

Missing numbers to complete sets will be sent on request made to the Lloyd Library, Cincinnati, Ohio, as long as the supply lasts. At present they can be furnished **excepting "The Volvae" and Mycological Notes, Nos. 1, 2, 3 and 4.**

*Written by Prof. H. C. Beardslee, and published at the Lloyd Library uniformly with the series of C. G. Lloyd. It is included in this Index.

EXPLANATION.

From the time I was a mere lad Botany has afforded me my principal recreation. During the long years when it was necessary to devote most of my time to a commercial life in order to gain a livelihood, I found my chief pleasure to consist in studying and collecting plants. The larger part of my leisure time, my holidays. and, I suspect if the truth were told Sundays also, I roved the woods and studied vegetation. About ten years ago I became interested in Mycology. Prof. A. P. Morgan, of Preston, Ohio, gave me my first ideas on the subject. Then I began sending specimens to Prof. Ellis, who advised me regarding them, and then to Rev. G. Bresadola in Tirol, and to Prof. Patouillard of Paris. I shall always feel grateful to these gentlemen, for from them I gained a large part of what I know of the subject. To the great majority of persons Mycology is practically a closed book. This is not due to any inherent difficulty presented by the plants themselves, but to the condition of the literature. The bulk of that which is written on the subject is not sytematic but spasmodic. It seems to be history that when anyone takes up work with these plants he finds so much that he cannot determine, so much that is new (to him), that the greater part of his publications are isolated descriptions of "new species." I feel that the incentive to this new species work is largely egotism in order that the worker may add his name to the plant names—but I am told that I am "morbid" on that subject. However this may be, the result is that it is impossible in practice to determine the most of fungi from these descriptions. These plants are of wide distribution, and have been "described" and "named" over and over again, until the "literature" has become an almost unfathomable maze of meaningless and conflicting names. To clear up this entanglement as far as possible, appears to me the most desirable feature of the work. And yet, the field is so vast that one man can cover but a very small part of it. I have been working on the Gastromycetes for four or five years, and have published the results as they appealed to me. This is an index of the publications as far as the work has gone. As it is designated as "Vol. I", the intention is evident that others are expected to follow. I feel now that it is no longer necessary for me to give my time to business, (due to the liberality of my business partners, my two brothers J. U. & N. A. Lloyd) and can devote all my time to this work from which I get my greatest pleasure. The probabilities are therefore that no accident interfering in the future, the publication will proceed more rapidly.

In this index will be found a list of "Synonyms and Juggled Names". I do not claim that this is final nor that these names are buried for all time to come. "Synonyms" and to a large extent "Juggled Names" are matters of individual opinion, and the next man to work over the field, undoubtedly will not agree with me in entirety. They are practically buried however, as far as my future work is concerned, and as a large part of my past time has necessarily been engaged in their obsequies I have raised a little epitaph to their memory.

May 1905. C. G. Lloyd.

INDEX OF THE PRINCIPAL SPECIES.

NOTE.

Figures alone refer to pages of Mycological Notes: Gea. to "The Geastrae": Aus to "The Lycoperdaceae of Australia, New Zealand, and neighboring islands."

Those so closely related to others that they may perhaps better be called sub-species, varieties or even forms are indicated by a star (*) (See article on page 7 of this index).

Plants are indicated in this index by the names that I adopt for them now after a thorough study of the literature and specimens bearing on the conflicting nomenclature. In some instances my views have changed since I began working on the subject and the plants have been published under names not now adopted. These are indicated by foot note references to the names under which they were published.

If the figures are in parenthesis it indicates that in this reference the plant was only partially considered.

1 Bovista aspera.

2 Geaster Morganii.

1 Geaster fornicatus.
2 Geaster deli atus
3 Geaster fenestratus.
4 Geaster hygrometricus var giganteus.
5 Geaster tenuipes.
6 Geaster lageniformis.
7 Geaster saccatus var. major.
8 Geaster Drummondii.
9 Geaster radicans.
10 Bovista lateritia.
11 Mitremyces Ravenelii var. minor.
12 Mycenastrum spinulosum.

1 Scleroderma vulgare var. verrucosum.
2 Scleroderma verrucosum.
3 Scleroderma vulgare var. verrucosum.
4 Secotium rubigenum.

DESIGNATION OF VARIETIES AND FORMS.

The longer I work with puff-balls, the more specimens I study, the more vague appears to me the distinction between species, varieties and forms. I have about arrived at the conclusion that there is in nature (or in the puff-ball world at least) no such thing as a species. We find plants of various degrees of resemblance or of difference. We sort together those that appeal to us as having the same characters and therefore we make what we call a species. We sort together others of a different character and call them another species. That is seemingly very simple but the trouble is that about the time we get the characters of these two species fixed, some one sends in a collection of plants, intermediate, the members of which partake of the characters of both and the two theoretical species are invalidated.

It seems to me that our various species are only expressions of various degrees of changes that the plants have undergone or are undergoing due to varying life conditions. If we had all the plants that now exist or have existed, I believe we would surely have a continuous series from the beginning to the end. Probably many of these connecting forms have disappeared, but among the puff-balls enough remain to render their definite sorting into distinct species at the best, only approximate. The same can be said as to genera, and to a greater degree as to varieties and forms. The fact is, no one can define the amount of difference necessary to constitute a variety, a species or a genus. No system of nomenclature can attempt to give more than an approximate idea of the various degrees of resemblance between plants. There should unquestionably be associated with each species such characters as observation teaches are common to a number of individual plants and then the plant that has these characters most strongly marked, most typically represents the species. If the points of difference between two lots of individuals are sufficient to be noted and described, the plants are entitled to a name, and a binominal name is the simplest. It is therefore we believe, the best that can be used. To me a name as a variety is cumbersome. For example think of "Lycoperdon piriforme var. excipuliforme". Nor can I bring myself to believe that any plant should be inflicted with such a name as "Lycoperdon piriforme excipuliforme" At the same time I recognize that plants very closely resembling each other should be marked in some way, and Fries' system of simply starring such names impresses me as best. It is the system that has been adopted by me in this index and I shall use it in future.

SECONDARY INDEX.

Index to plants not Gastromycetes and to Gastromycetes mentioned in the text.

Those marked with a * were published as synonyms. Those with a ‡ as misdeterminations. Figures alone refer to pages of Mycological Notes; Gea to "The Geastrae:" Aus. to "Lycoperdaceae of Australia, New Zealand and neighboring islands:" Am. to "Notes on Amanitas of the Southern Appalachians" by H. C. Beardslee: Gas. to "The Genera of Gastromycetes:" Vol. to "Compilation of the Volvae"

INDEX TO MISCELLANEOUS SUBJECTS.

INDEX TO PLATES VOLUME I.

1 Correct error "arachnin".
2 A species very? to me now.
3 Labeled Bovista aspera.
4 Correct spelling "radicatus".
5 Misdetermined Bovista lateritia.
6 Labeled Mitremyces Ravenelii var. minor.
7 Correct spelling "Delastrei".
8 Correct spelling "aurantiacum".
9 Correct spelling "verrucosum".

INDEX TO CONTRIBUTORS' NAMES.

The published lists of Contributors who have aided us in the work by collecting specimens are by no means complete. The list of the foreign specimens, received by me during my previous stay in Paris, has not yet been published, nor of those now awaiting me at my Paris address, (107 Boulevard St. Michel). Nor yet of those that I found at my home address (224 West Court St , Cincinnati, Ohio), on my return from Samoa, (March 1905).

All the packages received have been acknowledged by letter and lists will be printed as soon as possible.

Synonyms and Juggled Names.

Index of synonyms and plants imperfectly described, imperfectly known or based on imperfect material. Also juggled names.

NOTE.—Figures alone refer to pages of Mycological Notes: Gea. to "The Geastrae:" Aus. to "Lycoperdaceae of Australia, New Zealand, &c:" L. to "Letters."

Requiescat in pace.

ADVERTISING PAGES.

In my opinion, the prevailing custom of attaching the names of writers to the names of plants serves no purpose unless it be to gratify the vanity of authors. It results in a great deal of very bad work, and innumerable synonyms.

It is however, the prevailing custom and I am well aware that it will not be discontinued or even modified because of the fact that I, personally, neither believe it proper nor to the interest of science. A number of my correspondents are willing to accept my determination of Gastromycetes who desire to use or publish the same, but who feel that the names I give are not complete inasmuch as I do not attach to each binomial a personal name.

For the benefit of these parties I herewith append such a list of the principal species that have been considered in Mycological Notes.

In making the list I record the name of the person who proposed the specific name and who I feel in most instances is entitled to all the advertisement † To place his name in parenthesis as though he were a secondary factor and then add the name of the individual who merely puts the species under the generic name is carrying the advertising feature much too far. To substitute for the first author the name of the second is little less than fraud. We strongly approve Prof. Ellis' remarks on the subject, to wit; "The piratical practice of omiting the first name and substituting the second in its place cannot be too strongly condemned"

Those plants that are so closely related to others that they are perhaps best called sub-species, varieties or even forms, are indicated by a star (*). (See article on page 7 of this index.)

Arachnion album, Schweinitz.
Arachnion Drummondii, Berkeley.
Battarrea phalloides, Dickson.
Battarrea Stevenii,* Liboschitz.
Battarreopsis artini, Hennings.
Bovista brunnea,* Berkeley.
Bovista minor,* Morgan.
Bovista nigrescens, Persoon.
Bovista pila, Berkeley.
Bovista plumbea, Persoon.
Bovista tomentosa, Vittadini.
Bovistella ammophila, Leveille.
Bovistella aspera, Leveille.
Bovistella australiana, Lloyd.
Bovistella dealbata, Lloyd.
Bovistella glabescens, Berkeley.
Bovistella Gunnii, Berkeley.
Broomeia congregata, Berkeley.
Calvatia caelata, Bulliard.
Calvatia candida, Rostkovius.
Calvatia Fontanesii,* Montagne.
Calvatia gigantea, Batsch.
Calvatia lilacina, Berkeley.
Calvatia olivacea, Cooke.
Calvatia sculpta, Harkness.
Castoreum radicatum, Cooke.
Catastoma anomalum, Cooke.
Catastoma circumscissum, Berkeley.
Catastoma hyalothrix, Cooke.
Catastoma hypogaeum, Cooke.
Catastoma Muelleri, Berkeley.
Catastoma pedicellatum, Morgan.
Catastoma subterraneum, Peck.
Cauloglossum transversarium, Bosc.
Chlamydopus Meyenianus, Klotzsch.
Clavogaster novo-zelandicus, Hennings.
Dictyocephalos curvatus, White.
Diplocystis Wrightii, Berkeley.
Gallacea Scleroderma, Cooke.
Geaster Archeri, Berkeley.
Geaster arenarius, Lloyd.

† When the article bears the name of two authors (not an unusual custom with those who wish to secure double advertisement , we append the name only of the author who, as we understand it, wrote the article. When one writes an article and another puts his name to it as we suspect in a number of instances, we can only be guided by the record

Geaster asper, Michelius.‡
Geaster Berkeleyi, Massee.
Geaster Bryantii, Berkeley.
Geaster coronatus, Schaeffer.
Geaster Drummondii, Berkeley.
Geaster floriformis, Vittadini.
Geaster fimbriatus, Fries.
Geaster fornicatus, Hudson.
Geaster giganteus,* Lloyd.
Geaster hygrometricus, Persoon.
Geaster limbatus, Fries.
Geaster mammosus, Chevallier.
Geaster minimus, Schweinitz.
Geaster mirabilis, Montagne.
Geaster pectinatus, Persoon.
Geaster plicatus, Berkeley.
Geaster rufescens, Fries.‖
Geaster saccatus, Fries.
Geaster Schmidelii, Vittadini.
Geaster simulans, Lloyd.
Geaster Smithii, Lloyd.
Geaster striatulus, Kalchbrenner.
Geaster triplex, Junghuhn.
Geaster velutinus, Morgan.
Geaster Welwitschii, Montagne.
Gymnoglossum stipitatum, Massee.
Gyrophragmium decipiens,* Peck.
Gyrophragmium Delilei, Montagne.
Gyrophragmium inquinans.*Berkeley
Gyrophragmium Texense,*Berkeley.
Hypoblema lepidophorum, Ellis.
Lanopila bicolor, Leveille.
Lasiosphaera Fenzlii, Reichardt.
Lycoperdon cepaeforme,* Bulliard.
Lycoperdon coprophilum, Cooke.
Lycoperdon cruciatum, Rostkovius.
Lycoperdon dermoxanthum,* Vittadini.
Lycoperdon gemmatum, Batsch.
Lycoperdon nigrum,* Lloyd.
Lycoperdon polymorphum, Vittadini.
Lycoperdon pratense, Persoon.
Lycoperdon pseudoradicans, Lloyd.
Lycoperdon pusillum,* Batsch.
Lycoperdon piriforme, Schaeffer.
Lycoperdon stellatum, Cooke.
Lycoperdon tephrum, Massee.
Mesophellia arenaria, Berkeley.
Mesophellia ingratissima, Berkeley.
Mesophellia pachythrix, Cooke.
Mesophellia sabulosa, Cooke.
Mitremyces cinnabarinus, Desvaux.⁂
Mitremyces fuscus, Berkeley.
Mitremyces luridus,* Berkeley.
Mitremyces lutescens, Schweinitz.
Mitremyces Ravenelii, Berkeley.
Mitremyces Tylerii, Lloyd.
Mycenastrum Corium, Guersent.
Myriostoma coliformis, Dickson.
Paurocotylis pila, Berkeley.
Phellorina australis, Berkeley.
Phellorina Delestrei, Montagne.
Phellorina strobilina, Kalchbrenner.
Podaxon aegyptiacus, Montagne.
Podaxon Muelleri, Hennings.
Polysaccum Boudieri,* Lloyd.
Polysaccum confusum,* Cooke.
Polysaccum crassipes,* De Candolle.
Polysaccum pisocarpium, Fries.
Polysaccum tuberosum,* Fries.
Protoglossum luteum, Massee.
Queletia mirabilis, Fries.
Schizostoma laceratum, Ehrenberg.
Scleroderma aurantium, Persoon.
Scleroderma Cepa, Persoon.
Scleroderma flavidum, Ellis.
Scleroderma Geaster, Fries.
Scleroderma tenerum,* Berkeley.
Scleroderma Texense, Berkeley.
Scleroderma verrucosum, Bulliard.
Secotium acuminatum, Montagne.
Secotium coarctatum, Berkeley.
Secotium erythrocephalum, Tulasne.
Secotium macrosporum, Lloyd.
Secotium melanosporum, Berkeley.
Secotium nubigenum, Harkness.
Trichaster melanocephalus, Czerniaiev.

‡ He did not give it this name, but it was the first of the specific adjectives he applied to it. The name is sired by necessity and dammed by antiquity. It has also been recently damned by Hennings.

‖ The name was proposed by Persoon, but for *this plant* by Fries.

⁂ Poor old Persoon is cheated out of his advertisement on this plant.

MYCOLOGICAL NOTES.

BY C. G. LLOYD.

CINCINNATI, O. November, 1898.

1—INTRODUCTION.

The generous appreciation that has been bestowed on my recent pamphlet the "Volvæ" by mycological workers in all parts of the country, evidences the growing interest in this branch of botany, and encourages me to further efforts in this line.

We have three practical methods of making record of fleshy agarics, and we will enumerate them in the order of value that we attach to them. 1st, Photographs; 2nd, Alcoholic Specimens; 3rd, Dried Specimens. Each is of value in preserving a record of an agaric, but neither is sufficient in itself (nor all together for that matter.) Agarics should be studied fresh. If you are acquainted with an agaric, have studied it as it grows and know it, you will probably recognize either a dried specimen, an alcoholic specimen, or a good photograph of it, but in my opinion, for the purpose of *study*, pictures or preserved specimens are at the best only aids.

Abont two years ago I began to have photogravures made of a few of my negatives of fungi and distributed them to a limited number of correspondents who have aided in the collection of a mycological museum. The expense attending this process of reproduction is considerable, the edition necessarily limited, and the issues few. Many persons have applied for sets and are willing to pay for them, but I now find it impracticable to make any additions to the list of recipients and I have been forced to deny not only these applicants, but besides a number who wish more frequent issues of these plates.

By means of the present pamphlet I shall record descriptions drawn from growing plants, and those who desire can obtain photographs from me at the actual cost of printing. These photographs will be sent unmounted with the descriptions pasted on the back, and so indicated by let-

ters that they can readily be kept in the order of classification. I am in hopes sufficient interest will be awakened so that I will feel justified in gradually issuing these photographs and descriptions, until the field is fairly well covered. Recognizing the growing interest in "edible fungi" I shall give preference in illustrating to those of economic value.

Since I have been working with the fungi it has been my custom to photograph those I have found and the result is that I have now over 450 $6\frac{1}{2}$x$8\frac{1}{2}$ plates of our native fungi. I have received many compliments regarding my photographs that I feel, should, with greater justice, have been given to *the lens*. Photography I consider to be largely mechanical, and anyone with a good lens and suitable apparatus ought with practice to succeed. In photographing fungi, it is necessary to have a "long focus" lens capable of covering, natural size of the object, a $6\frac{1}{2}$x$8\frac{1}{2}$ plate and with perfect achromatic properties and what is known as "depth of focus". Such a lens with camera will cost about $150.00. Every mycological club, and all students who can afford it should be equipped with this outfit, and I will be pleased to give further information in detail to those requesting it.

2—HYDNUM TINCTORIUM.

A Hydnum Analagous to Fomes.

Description.—Pileus dimidiate, sessile, hard, woody. Upper surface dark, almost black, concentrically zoned, (each zone I think, represents an annual growth) the outer (more recent) zone is brown.

Interior substance bright dark red color, hard.

Teeth numerous, about a cm. long, 2 mm. thick, acute, firm, light brown color, the interior dark red, under the microscope covered with spines as in Prof. Ellis' genus, Mucronoporus.

Spores hyaline, broadly elliptical, 4x6 mc.

Specimen received was 18 cm. long, 9 cm. wide, and 7 cm. deep. It is evidently of several years' growth. Traces of the teeth structure can be observed for 3 cm. into the substance of the pileus and it is evident that as the teeth grow each year, the substance of the pileus fills in between them at the base.

This specimen was sent by C. V. Piper, and collected on Abies grandis at Jansville, Idaho. Prof. Piper informs me that in that locality the hydnum was quite common on diseased Abies grandis trunks and that some of the specimens were much larger than the one sent me.

It is of exceeding interest being the first woody hydnum described, to my knowledge.

It might well be taken as the type of a new genus for which Prof. Ellis suggests the name Echinodontium, if this view be accepted, making the name Echinodontium tinctorium, E. & E.

Prof. Ellis advises me that the plant is evidently the same as one he received from the Alaska collection of J. G. Swan, but in that specimen the teeth were all broken off at the base and their hollow remains were mistaken for pores. The plant was described (Bull. Torr. Club, Vol. 22, p. 362,) as Fomes tinctorius, E. & E. The rich red color of the substance of the pileus is very peculiar, and Prof. Ellis states is used in Alaska for dyeing. I acknowledge my grateful indebtedness to C. V. Piper for this interesting specimen and to Prof. J. B. Ellis for aid in its classification.

3—THE ABNORMAL GENUS MYRIADOPORUS.

In 1884 Prof. Peck described (in Bull. Torr. Club, Vol. 11, p. 26,) a new genus Myriadoporus, which he stated at the time, appeared to him as an abnormal form of Polyporus. We found a specimen belonging to this genus this year and distributed portions to various mycologists. From a very interesting letter received from Prof. Patouillard regarding this specimen, I am enabled to present the following points regarding the genus. Myriadoporus as described has the "Hymenium cellular-porous; pores of the surface shallow, open, the others imbedded in the hymenium. The pores do not as in Polyporus form vertical parallel tubes, but rather cells or short tubes variously directed, so that a vertical section of the hymenium as well as a horizontal one is porous." Prof. Peck originally described two species. but numerous others have since been observed and it is found that they are always *sterile* and are abnormal forms of various Polyporii.

Prof. Patouillard has observed the form corresponding to Poria subacida, Polyporus adustus, Fomes connatus, Polystictus sanguineus, and Fomes marmoratus. The specimen we found was evidently derived from Polyporus delectans, and we have seen at Trexlertown, Pa., the form corresponding to Poria salmonicolor (?). The genus Bresadolia established by Spegazzini on a South American species, evidently belongs to the same forms. The specimen we found grew in close proximity to Polyporus delectans, and is without doubt a curious variation of this species, for no other soft, *large pored*, white species of Polyporus occurs in this section. Our photograph gives an excellent idea of this curious plant.

4—THE LARGE LEPIOTAS.

As the genus Lepiota is one of the easiest we have for the beginner to work with we will begin our description and photograph distributions, with this genus. We will select first the large species (7–10 cm, or larger) which we find around Cincinnati, reserving the small species for a future paper. Two species we have met, are omitted as we are not as yet sure about their determination.

Two of the species can be known by their dry rough pilei, resembling undressed leather, viz: Morgani and procera ; two by the flesh turning red when bruised, Americana and meleagris ; cepæstipes, a white species, by the abundant flocculent particles which cover the pileus ; naucinus, the other white species, by its smooth firm pileus devoid of scales and meal ; acutesquamosa by the erect blackish scales ; rubrotincta by its dark red, thin cuticle, often cracked or peeling off, but not broken into squamose scales.

5—LEPIOTA MORGANI.

Pileus globose when young, then explanate, white, covered with large, shaggy, darker scales. Gills, remote from the stem ($\frac{1}{2}$ cm), narrowing in front, broader behind, when mature pale *greenish* color. Ring large, firm, distant from the gills, sometimes fixed, sometimes movable. Stem cylindrical, firm, stuffed then hollow, slightly thickened below, surface smooth. Spores, *greenish* in mass, 7x12 mc. apiculate.

This is much the largest species we have; stipe 30 to 40 cm. high, 2 cm. thick, pileus 20 to 30 cm. broad. It usually grows in wet pastures. It does not occur in the east, but is quite frequent with us and ranges southward, being reported from Georgia, Berry Benson; and Louisiana, Father Langlois. It is readily distinguished from all other known agarics by the *greenish* color of its gills. It was named for its discoverer, Prof. A. P. Morgan one of the leading mycologists of our country.

Regarding the edible properties of this species reports are conflicting. I have eaten it without any bad result, and Berry Benson used to write me it was a regular article of diet with him. Prof. Peck advises me however, that some of his correspondents report indisposition from eating it. I do not think it has any poisonous properties, but probably does not agree with some stomachs like many articles of food. Our photograph is necessarily taken from small specimens not more than one-third the usual size.

6—LEPIOTA PROCERA.

Pileus ovate, then campanulate or expanded, with a small prominent unbo, covered with brownish dry cuticle which breaks up (save the umbo) into adnate, torn scales. Flesh soft, white. Gills white, remote from the stipe. Ring firm, remote, usually entire and movable. Stem tall, firm, thickened at the base, hollow, the cuticle cracking, forming appressed fuscous scales. Spores white, 10x14 mc. broadly ovate, not apiculate.

This is a large species. but smaller than the preceding. Stipe about 20 cm. high; pileus 10-15 cm. broad. It is rather rare around Cincinnati, being generally found in the fall of the year in woodland pastures. It is however of wide distribution in this country, being reported from many localities. Regarding its esculent properties, all authorities agree that it is *most excellent.*

It makes a beautiful photograph, and our picture will give a better idea of the plant than any possible word description, and I might add, than any colored plate I have ever seen.

7—LEPIOTA PROCERA, FORM RUBESCENS.

Description agrees with procera in every respect save that the gills become slowly red spotted when bruised.

I have no doubt this is the plant on which L. rachodes is based in Prof. Morgan's flora, but I would consider it hardly a good variety of procera. The plant of Europe usually referred to L. rachodes differs from procera, especially in its smooth stem, besides it belongs to the section *quickly* turning red when bruised, analagous to L. Americana (if not that species).

8—LEPIOTA AMERICANA.

Quickly turning red when bruised or cut. Pileus convex, then expanded, flat or sometimes umbonate, margin in large specimens usually strongly striate, white, but covered with a red cuticle which breaks up (save on the disk) into large, somewhat adnate, scales. Gills free, broad, white. Ring entire or sometimes torn. Stem smooth, hollow, or

stuffed, sometimes thickened below, (sometimes not, see photograph), frequently enlarged below into a bulb-like swelling, like "cepæstipes." Spores white, subelliptical, 5x7 mc.

The fresh plant turns red when bruised or cut; it also dries red, and turns alcohol red into which it is placed. It is of wide distribution from Louisiana, (Father Langlois) north and east. It is a common plant in the late summer at Cincinnati. Sometimes we find it in the grass, then it is frequently large. Usually it grows at base of stumps and rarely on decaying wood. I am strongly of the opinion that it is the same plant known as rachodes in Europe, though no one would suspect it from Cooke's plate. Some figures such as Price and Barla closely approximate it. I presume the early records of "rachodes" from this country are based on this plant. I have sent *dried* specimens to two of the leading mycologists of Europe. One states "It is unlike any species we have in Europe, and I consider a good species." The other, "It is identical with Lepiota Badhami, Berk. and to Lepiota rachodes of most authors, but scarcely as described by Vittadina, which according to his description has not yet been re-discovered."

Regarding the edible properties of the plant, there is no question of its wholesomeness, but its change of color makes an uninviting dish.

9—LEPIOTA MELEAGRIS.

Pileus explanate, obtuse, white, but covered with small brown scales. Flesh white, turning red spotted when cut or bruised, afterwards turning brown. Gills white, remote. Ring fragile, soon withering. Stem usually swollen below, stuffed, generally brown spotted. Spores, 4x7 mc.

This plant approximates the preceding in its properties of turning red when bruised, turning alcohol red, and drying reddish. It is however, a much smaller plant and occurs in rich leaf mold in the woods, where we rarely find Americana. It grows singly or three or four caespitosé. The whole plant (especially when handled) is covered with brown spots which make it appear dirty and untidy. Below the ring, the stipe is covered with loose white fibrils (more perhaps in the nature of pruinosity) which turn red quicker when bruised than any other part of the plant. The stipes are usually much swollen but some times very slightly as shown in Cooke's figure and in our photograph.

Our plant differs somewhat from the English description. The stem is not "tinged with yellow." The flesh does not change to a "beautiful red" when cut but merely red spotted. Cooke's figure shows pileus and *stipe* covered with *black* scales; our stipe is destitute of scales and those of the pileus are brown. I do not believe that Stevenson's description or Cooke's figure applies to Sowerby's original figure which shows much fewer and *larger* scales than our plant and the stipe is solid. I do not find any record that the plant is edible, though I do not question it, as all similar species are.

10—LEPIOTA CEPÆSTIPES.

Pileus campanulate, or convex, even, save the margin which is usually striate or sulcate (sometimes however, not), pure white, or very slightly brownish only at the disk, covered with large, loose, floccose, white scales, easily rubbed off. Gills free, pure white, rather broad. Flesh thin, white. Stipe thickened at the base, tapering up, and slightly enlarged at the insertion in the pileus, white farinose but with

a slight yellowish tint when the mealiness is rubbed off. Ring large, lacerate, soft, usually torn. Spores elliptical, 6 x 8 mc.

The specimen photographed, and from which the above description was drawn, was referred when collected to Prof. Peck's "farinosa." Having received from Prof. Burt an alcoholic specimen of the same plant labelled "cepæstipes syn. farinosa" on further study of the European plant and descriptions we coincide in Prof. Burt's views. Judging from the foreign plates and from alcoholic specimens received from the South (Father Langlois) the plant photographed differs from the usual form in being much larger and not having a typical "cepæform" stem. In Europe and in the South (Benson) a yellow form also occurs.

Some of my alcoholic specimens have *abruptly bulbous* stems but that this is not always a character, see Greville's figure.

The character of the plant seems to me to be the dense mealiness covering all portions especially when young, well shown in our photograph (but not in the principal foreign plates, Barla, Cooke, Greville, Sowerby, though covered in their text) and Prof. Peck's name, farinosa, would be more appropriate than the name it bears.

We distribute photographs of two forms, one the large form (L. farinosa Pk.), the other the smaller form agreeing more closely with the European plant save the stipe is not so "cepæform." All authorities concur in its being edible.

11—LEPIOTA NAUCINUS.

Pileus white, convex then expanded, obtuse, smooth. Flesh soft, white. Gills free, narrower in front, white, discolored when old. Stipe firm, white, smooth, stuffed, then hollow. Ring entire, white. Spores 6 x 7 mc.

This white species can readily be distinguished from the preceding by the absence of the mealiness. We generally find it pure white and smooth. Sometimes however there are a few minute darker scales on the pileus. Prof. Peck considers our American plant distinct from the European under the name naucinoides.

From an economic standpoint we consider this the most important mushroom we have, except the field agaric, Psalliota arvensis. We prefer its flavor and it often occurs in the greatest abundance. The plants are not so much infested by larvæ as the field agaric. It usually grows in pastures in rich moist situations where the grass is green. Sometimes in the fall in the rich bottom land around Cincinnati the fields are full of it. There is only one danger in collecting it. An inexperienced collector may mistake Amanita phalloides for it, as they resemble in general appearance. Unless you are sure of it do not gather a "white mushroom" in the woods, or in newly cleared ground, or woodland pastures.

12—LEPIOTA ACUTESQUAMOSA.

Pileus convex or expanded, obtuse or subumbonate, covered with brownish fibrils which coalesce and form *erect* blackish scales, thickly covering the pileus especially the disk. Gills white. narrow, close, free, crowded. Ring thin, large, white, often *cobwebby*, frequently torn. Stem equal or thickened below, stuffed or hollow. Spore, long, 3 x 7 mc.

There are many species with spreading scales but this is the only large one we have with erect scales; (felina has similar scales but it is a *small* plant). Fries recognizes two related species Friesii and acutesquamosa the former with appressed scales and branched gills, the latter with erect scales and simple gills.

Our plants all have *erect* scales; sometimes the gills are simple, sometimes a few only branched, and sometimes most of the gills are branched. We would consider them all, acutesquamosa but would modify Fries' gill characters. It seems to me the descriptions of this plant do not emphasize enough the peculiar *cobwebby* veil in which it differs from all other large species. Usually it is woven into a thin membrane as shown in our photograph, but we have a photograph (425) where the veil consists of distinct fragile threads, like a spider's web. We only find the plant in the woods, and generally growing in soil thickly mixed with decaying wood as where a log has rotted away. Our photograph distributed (one of the first we made, No. 37) is not as good as we would like and we will probably substitute later a better one.

13—LEPIOTA RUBROTINCTA.

Pileus explanate, thin, obtuse, entirely covered with a reddish thin cuticle, which often cracks or peels away but does not break up into scales. Gills close, free, white. Flesh white. Stipe slender, equal or slightly thickened below, white, smooth, hollow. Ring usually entire, white, or the margin often similarly colored like the pileus. Spores, 5 x 7 mc.

This is a beautiful species found in the woods. Prof. Peck compares it to cristata but if I have correctly identified his species it seems to me to have little in common excepting the *color* of the pileus cuticle. The thin cuticle often cracks or peels away in a radiating manner, but does not form similar spreading scales, to cristata. Often we find specimens of this species with the cuticle unbroken, never in cristata save on the very disk. In our photograph the three erect plants have the usual character of the cuticle, very rarely we find it as seen in the specimen where the full top of pileus is shown. I consider Lepiota carneo-annulata, Clements the same plant. Often we find specimens with the ring beautifully incarnate margined. The species is no doubt edible but not abundant enough to be of any importance.

14—PHOTOGRAPHS.

In order to encourage a more general study of our native agarics, I will supply photographs of the plants described in these pamphlets at cost of printing, viz. 10 cents each, and will send a set of twelve photographs representing the plants here described, on receipt of $1.20. With the aid of these photographs and descriptions, any one should recognize the specimens when found growing. Having disclaimed any personal credit for the excellence of my photographs and given it where due to the *lens*, it will not be amiss to say that notwithstanding the lack of color I consider them the best illustrations of fungi I have ever seen and would not exchange them for any colored plates ever issued. Artists are often inaccurate but a good lens makes no mistakes. A delay of a week or ten days will elapse after receipt of order before the set can be mailed, as it requires this much time to have the set printed.

C. G. LLOYD, Court and Plum Sts., CINCINNATI, O.

MYCOLOGICAL NOTES.

BY C. G. LLOYD.

CINCINNATI, O. FEBRUARY, 1899.

15—THE SMALL VOLVARIAS.

Since the appearance of the "Volvae" we have received alcoholic specimens through the kindness of E. Bartholomew of the plant from which the description of V. striatula was drawn. It is entirely different from the little plant we have around Cincinnati, and which we had thought was the one covered by the description. We therefore have four at least (not three as stated in the Volvae) small species of Volvaria growing in the ground, which from our present knowledge of them we would class as follows:

16—VOLVARIA PUBESCENTIPES,

A small plant about 2½–4 cm. high, distinguished by the spreading hairs on the stipe. (Vide "Volvae" p. 11 and 17.) Evidently very close to V. plumulosa now considered in Europe a hairy form of parvula, (vide Pat. Tab. No. 333.)

17—VOLVARIA STRIATULA.

About the same size as the preceding and resembling most European plates of parvula in shape and size, but distinguished from the plates in being striate. (vide "Volvae" p. 11 and 16.)

18—VOLVARIA PUSILLA.

Pileus explanate, white, fibrillose, dry, striate, center slightly depressed when mature. Gills white, becoming flesh color, free, distant. Stipe white, glabrous. Volva split to the base into four, nearly equal, segments. Spores broadly elliptical (almost globose,) 5-6 mc.

This is our **very smallest** species not more than one-third the size of our other "small" species and rarely over a cm. high. It grows on the ground usually among weeds, and requires close hunting to find it. We have met it several seasons. The volva almost equally four parted to the base resembles the petals of a cruciferous flower. We adopt Persoon's name believing it is his species, and well named, and we think Fries is in error in refering Persoon's plant to parvula. Cooke's plate of V. temperata and Cordier's plate of V. parvula we take for the same thing, and having no good photograph of the plant from nature we reproduced Cordier's drawing which is an exact picture, size, shape, volva and all particulars of the plant as we find it.

19—VOLVARIA UMBONATA.

Pileus white, campanulate, at length plane, when moist slightly viscid, but silky and not viscid when dry, *strongly striate* to the umbo, furnished with a *decided prominent umbo.* Gills free, remote from the stipe. Stipe *solid*, smooth, white, slightly thickened below, (flesh white.) Volva white, irregularly split into segments. Spores varying in size, 5-7 mc. broadly elliptical or globose.

The plant usually grows in lawns. We have met it two seasons. Stipe 5-6 cm. high, 4 mm. thick. Pileus 3 cm. broad. It is about the same size as parvula and we were inclined to refer it to that species, especially as Fries underscores *umbonate* as a character. But it seems clearly distinct in its *solid* stem. Prof. Peck to whom we sent photograph, notes and dried specimens, considers it undescribed and we adopt the name he suggests for it.

20—A STANDARD OF COLORS.

There has recently been issued a little book that will find frequent use by every student in natural history, namely, the Prang's Standard of Colors, published by Louis Prang, Boston, Mass. We advise every one who is engaged in the study of the fungi to send 50 cts., to the publishers for this work. It contains plates showing 1176 distinct shades of color, arranged in a scientific series by a color expert, and on scientific principles. It is almost impossible to find a color in nature that cannot be very closely matched in the work.

We admit that there is no other one single subject that has caused us so much trouble in the study of mycology as the determination of colors. Not that we are color blind, but that we do not know the colors. In fact, there is no subject on which we feel there is so much general lack of knowledge as that of colors. If you do not believe it, take an agaric to three or four people, ask them what color it is, and you will find that hardly two of them will give it the same name. The general terms such as red, brown, etc., used in describing agarics do not convey any distinct idea.

We can now cite colors with the knowledge that we can convey the same to anyone else who is studying the subject by citing them according to the system in this Standard of Colors. It would seem to us that Prang could have adopted a better system of nomenclature, giving a distinct name to each shade of color illustrated, which name would convey an impression of the color better than the present citation. For instance "20Y03" is simply a formula conveying an accurate

knowledge in relation with the Standard, but conveying no idea whatever in the absence of the same. In future, colors will be cited by us in keeping with the system adopted in Prang's Standard.

21—SHORT NOTES.

Dr. Geo. E. Francis, of Massachusetts, reports the finding of the rare Amanita russuloides abundantly in September, 1897, also adnata, a species which heretofore had not been very satisfactorily reported.

Sarah B. Fay, Conn., also described a species she has met which we take to be adnata. She also records strangulata abundant in July, 1897.

Prof. Dearness records Volvaria gloiocephala from Canada. I am obliged to Prof. Dearness for correcting an error in the pamphlet, viz. Volvaria Loveiana was found on Clitocybe nebularis, not monadelpha as stated.

Capt. McIlvaine has called my attention to another mistake. Amanita "sperta" on page 3, should be Amanita spreta.

C. F. Wheeler, sends photograph of Lepiota Morgani, which he has found at several stations in Michigan, thus extending the range of this species.

Hollis Webster and Geo. B. Fessenden have sent specimens of what we take to be true Lepiota rachodes, Vitt. and Prof. Bresadola confirms the determination. We hope to receive fresh specimens of this next season, so that we can photograph and describe it in these "Notes." The species has been much confused with others.

Our edition (1000) of the "Volvæ" have all been distributed. We regret being unable to supply the frequent requests for the pamphlet.

22—CALVATIA AUREA.

IMMATURE PLANT.

Peridium compressed globose, the upper surface even, underside prominently and irregularly wrinkled. Cortex light brown, thin, minutely tomentose, cracked into small areolæ. Root white, cord-like, branched. Subgleba about as thick as the capillitium, white but *quickly turning* golden yellow when cut. Young capillitium white, turning yellow when bruised and in maturing.

In cutting an immature specimen the subgleba *quickly* turns yellow, the capillitium remaining white except when bruised by the knife. In drying it slowly turns yellow.

MATURE PLANT.

Peridium thin, breaking up and falling off. Capillitium dark olivaceous, subgleba much lighter, leather color. Spores globose, 4mc. smooth, short pedicellate. Threads long, branching, slightly thicker than the spores.

This plant I first found in 1896 in a garden at Pleasant Ridge, O. Additional specimens were brought in August, 1898, by Henry J. Koch, which grew in a hot house at Walnut Hills, O., and which agreed in every particular with the specimens I had found. It differs much in shape from C. rubroflava, Cragin, the only *yellow* species heretofore described and there is no suggestion of "red" in our plant. Lycoperdon xanthospermum, Berk, described from India, we judge is not a Calvatia.

23—THE GENUS PLUTEUS.

(OF CINCINNATI.)

We have collected ten species and varieties of Pluteus in the vicinity of Cincinnati, of which three are common, viz: cervinus, longistriatus, and admirabilis and the others rare, having been met only a few times and most of them only once. In addition Berkeley determined chrysophæus from this locality on dried specimens sent by Lea and Prof. Morgan determined leoninus. As neither author mentions admirabilis the only and common *yellow* species which we find here, we presume all determinations were made on the same plants. Prof. Morgan also notes two species phlebophorus and creatophyllus which we have never met.

The students of the genus will find the following characters assist in distinguishing the species.

Fries divides the genus into three divisions:

1st. Cuticle of the pileus fibrillose or sometime pubescent or tomentose. Here we would place cervinus (and its varieties,) granularis, longistriatus, tomentosulus,

2nd. Pileus pruinate with atoms–nanus and tortus (granularis notwithstanding its name does not belong in this section, if we have correctly determined it.)

3rd. Pileus smooth–umbonatus, and admirabilis.

The following points also should be observed, our notes of course, refer only to the species we have met.

Color. Most of the species are fuliginous, cinereous or umber, varying to quite light shades, one admirabilis, is yellow.

Striation. Prominent striations are characteristic of two species, longistriatus and umbonatus; tortus, nanus and admirabilis are sometimes faintly striate; granularis, tomentosulus and cervinus are not striate.

Rugulose pilei; the character of the pileus being rugulose (well shown in our photographs of nanus and granularis,) is a feature rather rare among agarics in general. It is marked in granularis, nanus, tortus and admirabilis, though the absence of the feature is not of importance as it seems to depend largely on moisture and conditions of growth and frequently we find specimens even.

Stipe; solid in all species save admirabilis which has hollow stipe; smooth or fibrillose in all species excepting, granularis with velvety stipe, and tomentosulus somewhat pubescent; tortus has a conspicuously twisted stipe, (see photograph.)

Habitat; admirabilis, granularis and longistriatus grow on logs; cervinus both on logs and in the ground, usually the latter; the remainder of the species grew in the ground. Peck gives the habitat of tomentosulus and nanus "decaying wood" The only specimens we ever met grew in the ground.

Spores; the spores do not afford any good character to distinguish the species we have met, as in all they are globose or almost globose and about 5 mc. in diameter.

24—PLUTEUS CERVINUS.

Pileus fleshy, convex then expanded, obtuse, even, glabrous, but appearing fibrillose, the cuticle at first continuous and sometimes slightly viscid. Gills free, white then flesh colored. Stipe stout, solid, fibrillose or smooth. Spores subglobose, 5–6 mc.

This is the most frequent species we have, not only at Cincinnati, but it seems to be common in most localities. Its usual color is cinereous or grayish or blackish brown. We have pure white specimens (var. alba, Pk.) in our collection from Prof. Burt, but the white form does not occur with us. Usually the specimens are more even and expanded than the photograph we distribute, which corresponds closely to the form called eximius in Europe. Slugs are fond of this species and it can be seen that a slug has eaten the cuticle of the specimen photographed. Fries' description (usually followed) describes the cuticle as afterwards broken into fibrils or scales, but that does not accord to our observations. The appearance of the cuticle is very deceptive. It seems to be fibrillose to the eye, but under a glass distinct fibers cannot be made out. In Europe the plant is stated to grow on logs and stumps. With us, while it so occurs, we most frequently find it in loose soil in the woods.

25—PLUTEUS CERVINUS, (SCALY FORM.)

Notwithstanding the usual description of pileus, "afterwards broken into fibrils and scales" we have only met this condition once which we thought was so unusual as to merit a photograph.

26—PLUTEUS CERVINUS, VAR VISCOSUS.

The normal character of the cuticle of the species is slightly viscid in wet weather, but the specimens we collected and photographed were exceedingly viscid. They also differed from the normal form in their lighter color, flesh much thicker at the disk and thin at the margins, and cuticle not *appearing* fibrillose. It is close to petasatus, but differs how-

ever, in its narrower gills and in having no striae. It is a good variety if it is not a good species.

27—PLUTEUS LONGISTRIATUS.

Pileus expanded, thin, blackish when young, brownish when expanded, deeply and conspicuously striate. Gills free, white then flesh colored. Stem equal, solid, glabrous, white. Spores globose, 5 mc.

The prominent features of this species are its very *thin* flesh and the prominent *striae.* When young the plants are dark, (blackish) but become light brown when mature. Owing to the almost absence of flesh the cuticle of the pileus splits between the gills in expanding forming the striæ, somewhat similar though not as marked as Coprinus plicatilis. The half grown plants are not at all striate. From Prof. Peck's remarks the plant must be rare in New York. With us it is very common on logs and seems to have a special fondness for hickory.

28—PLUTEUS ADMIRABILIS.

Pileus when plant is in its prime *bright yellow* becoming brownish when old, hygrophanous, glabrous, striatulate on the margin, frequently rugulose-reticulate. Gills free, remote, yellow then flesh colored. Stipe equal, slender, smooth, hollow, bright yellow. Spores subglobose, 5–6 mc.

This plant is frequent here and the only *bright* yellow agaric that I recall. It is close to chrysophæus of Europe from which Prof. Peck distinguishes it by the rugulose-reticulate pileus, but as it occurs here the pileus is ordinarily very slightly rugulose, if at all. It appears to me however, clearly distinct from chrysophæus in its *bright yellow* color, only brownish or cinnamon when past its prime, its smaller size, and the hygrophanous nature. The entire plant—pileus, gills and stipe—is yellow when in its prime. The stipe is very different from all others of the genus which I have met, in fact it is very close to a cartilaginous stipe and hence you would hardly look for the plant in the genus Pluteus. Although, a common plant here, it was several years before I arrived at its determination. The photograph is poor, but *yellow* plants are hard to photograph without a ray filter with which our camera is not equipped.

29—PLUTEUS GRANULARIS.

Pileus convex, then expanded, somewhat umbonate, strongly rugulosely wrinkled, covered with a dense coat of plush in nodules giving it a granular appearance, brown, darker on the raised portions. Gills free, pinkish. Stem equal, solid, striate, covered at the top with a coat of plush similar to the pileus, lighter color above. Spores globose, 5 mc.

This is an elegant and characteristic species but rare here, found on rotten wood. It is strongly marked by its rugulose pileus and peculiar velvety coat. The gills were colored when young (not white) and the specimens were pure brown, (no tinge of yellow,) otherwise agrees in every respect to original description save as to granules. The velvety coat was collected into nodules giving the plant a granular appearance, well shown in our photograph, but there were no granules. It is possible that we have not correctly identified Prof. Peck's species.

30—PLUTEUS UMBONATUS.

Pileus campanulate, with a prominent blunt umbo, reddish umber, excepting the umbo which is pale almost white, smooth, strongly striate to the umbo. Umbo even, smooth. Flesh very thin excepting the thickened umbo. Gills broad, free, flesh colored. Stipe white, solid, smooth, slightly tapering upward. Spores globose, 5 mc. with granular contents when fresh.

This description has been drawn from a single specimen found growing in the leaf mold. It does not seem to approximate any species we can find described. It is probable the plant was not fully developed and that the cuticle of pileus would split when expanded into long striations similar to longistriatus, to which it appears close, save in its prominent thickened umbo.

31—PLUTEUS TOMENTOSULUS.

Pileus expanded, dry, even, white with a pinkish cast, minutely squamulose-tomentose. Gills free, flesh colored. Stem solid, equal, white, densely fibrillose. Spores subglobose, 5–6 mc. nucleate.

We have found but a single specimen growing in the soil in woods. Prof. Peck described it from "decaying wood." Our plant agreed with description save it was not subumbonate and we would describe the stem as densely fibrillose rather than pubescent.

32—PLUTEUS NANUS.

Pileus expanded, brown with a dark sooty center when dry, rugulose when wet, even when dry, minutely densely scurfy, slightly striatulate on the margin when wet, not when dry. Gills free, rose-color. Stipe white, slightly grayish at base, equal, solid, smooth. Spores globose, 5 mc.

We found it but once growing in wet soil by side of a ravine. Owing to its habitat (it is usually recorded on decaying wood,) and to the dissimilarity between our photograph in size and Cooke's figures there may be some question of our determination. Still we feel our plant answers the published descriptions of the species, even as to its small size.

The "shiny" appearance of our photograph is not natural, but due to the specimens photographed, having lain in water and become water soaked.

33—PLUTEUS TORTUS.

This specimen we have only seen once. It was collected several years ago, and the notes made at the time were scanty. As we referred it to "nanus" when collected we presume the pileus was pruinose. Our notes simply state "The brownish pileus has a darker umbo and it is conspicuously and prominently rugulose. Stem very smooth, shining, white, solid, *twisted*." Our photograph does not show the rugulose pileus and we presume it dried and became even before it was photographed, but it does show in a characteristic manner, the peculiar twisted stipes. Whether this is an accidental feature of these specimens or peculiar to the species is only conjecture. If the latter, the name we propose (pro tem.) tortus, will not be inappropriate.

34—PHOTOGRAPHS.

Set (No. 2) of ten photographs illustrating fourteen plants described in this issue will be sent on receipt of one dollar. Two photographs (Clitocybe monadelpha,) to be described in next pamphlet will be included in the set in order to make an even ten.

The large number who have subscribed to the previous set is exceedingly gratifying to me. While there are no pecuniary returns in the sale of these sets, (they being distributed at exact cost to me,) I am greatly pleased at the interest taken in them as evidenced by the orders and the many very pleasant words received regarding them, some of which we take the liberty to reproduce. There was only one unpleasant feature in connection with the distribution. The orders received so far exceeded our expectations that owing to the poor light for photographic printing in our city during the winter months, our printers (Messrs. Rombach and Groene) have not been enabled to keep with the orders and much delay has been experienced in mailing the sets. *At least one-third of the orders are as yet unfilled*, but will be mailed in the order of receipt, as fast as we receive them from the printer. Most of those who received set No. 1, have expressed themselves as much pleased with them.

"The photographs of Lepiotas arrived in good condition. They are exceedingly fine and I am very glad to get them and thank you for giving me the opportunity to get them. These photographs are much better than any plates I have ever seen. They exhibit the characters of the species." DR. E. A. DANIELS, Boston, Mass.

"I had no idea the plates could show so clearly the characters of the various species. I trust you will continue the series." F. M. COMSTOCK, Cleveland, O.

"Photographs received in splendid condition. They are very beautiful and interesting and I hope to enjoy them very much in the future." E. HARRIS, Cambridge, Mass.

Your photographs were shown to the members of the Philadelphia Mycological Society at their last meeting. The opinion expressed was that they supplied a desirable and effective means of study, next best to natural fungi in their fresh condition."
CAROLINE A. BURGIN, Secretary, Philadelphia, Pa.

"The photographs received. It is a pleasure to commend your excellent work."
D. H. ALLEN, Brooklyn, N. Y.

" The photographs reached me in safety and I think they are the finest I have ever seen, which is saying much as I have taken pictures of all kinds for fifteen years or more. They are much better than any colored plates could be," QUINCY POND, Auburndale, Mass.

"I am much pleased with your photographs. They are excellent."
E. W. D. HOLWAY, Decorah, Iowa.

"I received yesterday the twelve photographs of fungi and I am much indebted to you for these, as they are by far the best illustrations on the subjects I have ever seen and I hope that I may have copies of all that you publish." WM. KNOX, Cleveland, O.

"The photographs of fungi have been received in good order, and I must confess I am delighted with them. Your claim that they are superior to colored plates is fully sustained, as I consider it impossible to show the characteristic features better than in the faithful copy of the camera, which reproduces even the finest details." HUGO BILGRAM, Philadelphia, Pa.

"I am very much pleased with the photographs and consider them not only fine pictures, but better than the usual colored plates." MISS M. C. WILLIAMS, Canandaigua, N. Y.

"Your very excellent photographs have duly come to hand. I find them very fine. I will want the whole series. It seems to me that by thus bringing your collection within reach of students, you will make a very valuable contribution to the study of fungi."
W. C. BATES, Boston, Mass.

Set No. 2, (10 photographs) sent on receipt of one dollar. Sets Nos. 1 and 2 (22 photographs) sent on receipt of $2.20. *All orders subject to delay in printing.* With the advent of brighter weather however, we look for much quicker service.

C. G. LLOYD, Court and Plum Sts., CINCINNATI, O.

MYCOLOGICAL NOTES.

BY G. G. LLOYD.

No. 3.

CINCINNATI, O. APRIL, 1899.

35—SOME CHARACTERISTIC PLANTS.

We believe in taking up a genus at a time and describing all the species we have met and do not favor isolated descriptions of fungi. The following plants however are so frequent and marked that they will be noted by most collectors. The descriptions of the two volvarias complete all the species of this genus we have observed.

36—CLITOCYBE MONADELPHA.

Pileus convex, obtusely umbonate, center depressed when old, sometimes yellowish honey color, but usually reddish brown, fibrillose, scaly. Flesh solid, pale flesh color. Gills short, decurrent, pale flesh color. Stem long, slender, solid, equal or tapering to the base, pale brownish or flesh color, darker below.

It grows here in great abundance in the fall *densely caespitose* usually at the base of stumps. I would place it in the Disciformes. It has a curious history. First, it was collected by Lea, who sent it to Berkeley, who named and described it as Lentinus cæspitosus. Berkeley in the Journal of Linnæan Soc. (Vol. 10, p. 287,) apparently on the advice of Dr. Curtis who informed him, "it was certainly an Agaric," changed it to Pleurotus cæspitosus and finally Prof. Morgan named it Clitocybe monadelpha. It is described under *all three of these names* in Saccardo, and as Prof. Morgan was the first to correctly classify it, we prefer to retain his name. It has a close resemblance to some forms of Armillaria mellea in size, shape, color and texture, but can be distinguished by its cæspitose habits and absence of ring. Dr. Curtis says "when dry it has a kind of acid-sweetish odor not unlike that about a cider-press." Rev. A. B. Langlois sends us abortive forms of the plant similar to those we find of Clitopilus abortivus. Prof. Peck has very recently illustrated the plant among his plates of *edible species* and states that the flavor is superior to that of Armillaria mellea. It is a rare plant in New York and East, but abundant enough in the West and South.

37—FLAMMULA RHODOXANTHUS.

Pileus obconic, or when old somewhat infundibuliform and depressed in the center, buff brown, minutely tomentose and soft to the touch, the cuticle usually finely cracked. Gills bright golden yellow, arctuate, long decurrent, faintly venosely connected. Flesh white, becoming yellowish when old. Stem solid, equal, punctate with small reddish brown scales. Spores *light yellow*, oblong, 5x12 mc., resembling somewhat in shape those of Boletus.

The plant was originally described by Schweinitz as Agaricus rhodoxanthus (Syn. Car. No. 640.) and in Syn. Am. Bor, (No. 256,) he included it in the genus Gomphus (Gomphidius of recent nomenclature.) Fries (Epic. 1st ed., p. 326,) referred it to Hygrophorus leporinus, no doubt on the strength of dried specimens received from Schweinitz. It has little resemblance to Cooke's figure of this species, but the figure of H. hypothejus, were the gills more yellow and the stem punctate with minute brown scales, could be taken for it. However, it is no Hygrophorus, the gills are not at all waxy.

Berkeley describes it from dried specimens sent by Lea, as Paxillus flavidus. There are some discrepancies in his description, but it is without doubt the plant he had in view. It is not "viscid," nor are the gills "forked at the base." Moreover it is *not* a Paxillus, for the gills are not readily separable from the pileus. Nor is it a Gomphidius, for it has no universal glutinous veil, nor does it agree either in *color* or *shape* of the spores.

It is a frequent plant around Cincinnati, and mimics Boletus subtomentosus so closely both in color and shape of top of pileus of young plants, that we cannot distinguish them until we pick them up and examine the under side. Prof. Peck (29th Rep.) states "the pileus is not always red, but varies sometimes toward yellow, sometimes toward brown." With us it is always brown.

38—VOLVARIA BOMBYCINA.

Pileus white or slightly fuscous, fleshy, soft, campanulate then expanded, covered with silky fibers which become when old somewhat squamulose. Gills free, remote, flesh colored. Stipe solid, slightly attenuated upward, even, smooth, white. Volva large, thick, irregularly ruptured, persistent at the base of the stipe. Spores elliptic 6x8 mc.

This plant is frequent though not abundant. It mostly grows on maple and is frequently found on the decaying wood around a sugar tap. We have seen it on beech. It is the largest species of the family. The volva is large and thick and it is not unusual to find the young plant entirely enclosed in the volva, looking like a young phalloid. Stevenson states it is "considered edible," but we would be suspicious of it, especially as most Volvarias are reputed poisonous. We present two photographs of the plant, an upper and under view, and from these photographs no one can mistake it.

39—VOLVARIA VOLVACEA.

Pileus campanulate, than expanded, cinereous, covered with fine dark, appressed silky fibrils. Stipe solid, white, smooth, equal. Gills free, flesh colored. Volva thick, irregularly broken. Spores elliptic, 5x7 mc.

This is a much smaller plant than bombycina and grows in the ground, usually in cellars, hot houses, &c. We have collected it several years in the cellar of our drug store, and R. L. Hawkins has sent it to us from his drug store cellar. One year we found it in the woods.

40—PLUTEOLUS COPROPHILUS.

Pileus expanded, thin, brown, finely and thickly striate, excepting the ever depressed disk, slightly viscid when moist. Flesh very thin with a slight pink tinge. Gills free, narrow, pale cinnamon color. Stipe long, smooth, glabrous, hollow, pure white. Spores broadly elliptical, 9x11 mc.

Prof. Peck describes this plant from "dung heaps" and calls it "dung-loving Pluteolus." We have found it growing abundantly in rotten straw around straw stacks which was free from manure It is usually caespitose, and we have seen clumps where it has dried in situ. From our conversation with Prof. Morgan we believe his description of Bolbitius radians was drawn from this plant. We have never seen it however, with the "pellicle broken into scales on the disk."

41—BOLBITIUS SORDIDUS.

Pileus ovate when young, explanate when mature, thin, pure snowy white when young, sordid when old, glutinous, hygrophanous, margin smooth and even when young, plicate

sulcate and ragged when old. Gills ovate, free, firm and white when young, becoming cinnamon color, moist and flaccid when old. No trace of veil even in the youngest plants. Stipe pure white, scurfy, hollow from the first. Spores ovate, 6x9 mc.

It grew on rotten shavings which had been used for horse bedding and were mixed with manure. Both Prof. Peek and Patouillard confirm my opinion that it is undescribed. Most species of Bolbitius are yellow, but this is pure white when young, no trace of yellow. Conocephalus of Europe is a white species but it is conical and the gills are broader. Prof. Peck says "I see no evidence of dissolving gills and it seems to me a Pluteolus." Stevenson says of the gills of Bolbitius "becoming moist (but not melting away,)" That the gills of our plant become flaccid, can plainly be seen from our photograph. I do not understand that the gills of Bolbitius deliquesce like those of Coprinus.

42—CLITOCYBE ILLUDENS.

Pileus orange-red, fleshy, convex or expanded, obscurely umbonate, smooth, fibrillose, the cuticle sometimes cracking. Flesh concolorous. Gills unequally decurrent, narrow toward each end, orange yellow. Stipe long, smooth, solid, tapering to the base, usually somewhat excentric. Spores about globose, 5 mc.

This species grows caespitose in great clumps, usually at the base of a stump. It is found in the woods, but its favorite habitat is at the base of stumps in woodland pastures or old fields. In the fall of the year we find it in abundance, the large mass of bright color attracting the eye from a distance. I have noticed it from the road in a woods 800 feet away.

No other plant is so frequently brought or sent to me for name, as its rich color and large size attracts the attention of all who see it. The beginner will be surprised to find the bright *yellow* gills throw down white spores. So far as known this is a peculiarly American plant, and was described by Schweinitz in 1822 under Gymnopus. He states that the gills are "branched" which we think is an error Fries in Novae Symbolae (1851) from dried specimens sent by Curtis, concluded that it is a Panus, which is a good illustration of what an erroneous idea of a plant an experienced worker may get from dried material. Saccardo compiles it under both Panus and Clitocybe. Schweinitz attributed to it an odor disgusting "fastidiosus," which Fries interprets foetid. If the plant has an unpleasant odor we have never noticed it, though we are deficient in the sense of smell. It is surely however not "foetid." Prof. Farlow compares the plant to Pleurotus olearius of Europe and infers that it may be a Pleurotus, with which genus it would not be far out of place.

The plant when cooked has a pleasant taste but must be avoided, as both Prof. Farlow and Mrs. Williams record a number of cases of poisoning (none fatal however) from eating it. Its properties are strongly emetic.

Under the head of "The 'Jack my Lantern' Mushroom" a name given to it by the negroes, Mrs. M. E. Williams describes it in a recent number of "The Plant World" and notes a phosphorence given off by the gills when placed in the dark.

The plant is usually about a foot high and six to eight inches across the pileus. Our photograph was made from a very small specimen not one quarter the usual size.

43—COLLYBIA ZONATA.

Pileus convex then expanded, thin, with a small umbilicus, covered with coarse, tawny, densely matted hairs, arranged in obscure zones. Stipe firm, slightly tapering down, covered with tawny hairs similar to those of the pileus. Gills narrow, free, white. Spores elliptical, 4–4½ mc.

This is a very characteristic plant and well named. It has many features in common with C. stipitarius, in fact seems an enlarged edition of that plant, but the discrepancy in size and habits is so great that we would not think of uniting them. Bresadola says "It is in my judgment a *large* variety of C. caulicinalis, (usually known as C. stipitarius in this country, —Lloyd,) same spores, same basidia, same cystidia, and color of hair corresponds, only it is larger and different habitat." We find there is a specimen of this plant in the Schweinitzian herbarium labeled "Lentinus tenaciformis. Schw. Mss," but Schweinitz never published it. This is a characteristic plant and makes a characteristic photograph from which the plant can be recognized on sight, and we challenge any one to make a "colored plate" which will better depict the plant than the photograph that we send out.

44—STROBILOMYCES STROBILACEUS.

Pileus blackish umber, tough, broken into large, thick, squarrose-squamose scales, the margin appendiculate with scales and fragments of the veil. Flesh whitish, changing to sienna-red then black when cut or bruised. Pores white, becoming brown or blackish by age, large, angular, adnate to the stem or sometimes depressed, changing color when cut the same as the flesh. Stem equal, solid, floccose-tomentose, brown below lighter above. Spores subglobose, rough, 7-10 mc.

This seems to be a frequent plant over wide territory. It is more common with us than in Europe. It is known as the "Black Boletus." Many authors (including Fries) place the genus Strobilomyces with the genus Boletus. It differs in having pores that are not easily separable from the pileus, besides its general habits and globose rough spores. Two forms, one with the tubes equal, the other with tubes shortened near the stem are found in this country, differing in no other respect. The latter form is the more frequent with us and is the one photographed. It has often been referred to Strobilomyces floccopus, a species described with a thick veil appendiculate as a ring on the stem. We would not consider our American forms sufficiently distinct to merit different names. To those who have our sets of photographs it is needless to describe the plant. The photograph tells the whole story.

45—COLLYBIA RADICATA.

Pileus convex, then expanded, frequently somewhat gibbous, thin, glabrous, generally rugose, usually slightly viscid, sometimes exceedingly glutinous. Flesh white, Gills distant, broad, shining white, firm, adnexed and usually very slightly decurrent. Stipe long, rigid, slender, stuffed, at length striate, smooth or furfuraceous, always penetrating deep into the ground with a long tapering root. Spores large, elliptical, obliquely apiculate at the base, 15–17 mc.

Were I to be asked what is the most common agaric around Cincinnati I would state this plant. From the middle of May, when it first appears, till late in the fall, we seldom go into the woods without meeting it. It varies in size from a little pileus 2 cm, across up to 15 cm, and grows from 5 cm. to 25 cm, high. Its usual size is pileus 6-8 cm. In color in early season, it is usually pure white, but later brown or dark brown; occasionally we meet a specimen pure yellow. It also varies much in viscidity, usually very slightly viscid, scarcely noticeable, at other times we meet plants very glutinous. Notwithstanding its variations we soon learn to identify it at sight by the gills, which once known, are always recognizable, to say nothing of the long, tapering root. (See young plant lying down in photograph.) We do not recall another agaric with such large spores (15-17 mc.) Our picture represents a cluster of plants as found in the woods. The plant however is more commonly solitary.

46—A NEW ILLUSTRATED WORK ON MUSHROOMS.

We have just received from Wm. Knox, of Cleveland, O., Part 1 of "Sketch Book of the Mycological Society of Cleveland, O." We are glad to welcome all efforts in this line. Part 1 contains plates of the following species:—Psalliota arvensis, Coprinus atramentarius, Pleurotus ostreatus, Coprinus micaceus, Lepiota naucinus, Marasmius oreades, Russula virescens and Lepiota procera.

The original intention of the author was to issue these plates solely for the use of the members of the Mycological Society of Cleveland, O., but we have suggested to the author, and it has been adopted that plates of this kind would be of great service to all students throughout the country, and that if issued at a reasonable price, would probably have a wide circulation. Mr. Knox says that he will send the parts on receipt of 50 cents per part, consisting of eight plates and we would say they will be cheap indeed at that price.

The artistic part of the work we consider very good indeed. The drawings are quite characteristic of the species

indicated. The artist has not overlooked little details such as the annular zone on Coprinus atramentarius, showing that he is a mycologist as well as an artist. The plates have a natural appearance as though the plants grew, the author having avoided the stiff, inflexible effect we notice in many illustrations of American agarics, as though they had been cast in a mold.

We regret we cannot endorse the author's coloring of the plates as we do the drawings, but we recognize how difficult it is to reproduce the colors of nature. In this regard however, they are no more at fault than many other plates, both of this country and of Europe. The plates will be of great service to anyone engaged in the study of mycology, and at the price offered should be in every worker's hands.

47—THE FOMES OF EUROPE.

Through the kindness of Rev. G. Bresadola we have recently received a full set of specimens illustrating the Fomes which occur in Europe, and a manuscript key to the various species described, showing Prof. Bresadola's views regarding their nomenclature and disposition. Prof. Bresadola has given special study to the Polyporii and has compared specimens in various museums of Europe, including the collections of the illustrious Persoon and Fries, and while this "key" was sent to me for my private information, I consider it too valuable to be lost to the world and take the liberty of publishing it. It is a matter of gratification to me that Prof. Bresadola's views tend to the reduction of species, for the undue publication of species on slight differences or insufficient knowledge of existing species, is one of the chief difficulties we must contend with in the study of Mycology. The term "unknown" in the key must be read "unknown to Bresadola" to give it its true sense. We hope at an early date to publish a paper on the American species of Fomes in the light thrown on them by comparison with Prof. Bresadola's set from Europe.

Prof. Bresadola divides the genus into two genera. Fomes and Ganoderma, the latter distinguished by its colored spores and the shiny rigid crust of the pileus. The species marked with a * belong to Ganoderma.

KEY.

Species in Fries' Hymenomycetes Europaei.

PILEATE.

australis, Fr.*
vegetus, Fr.*
lucidus, Leys.*
Inzengae, Fr.=var. of fomentarius.
Stevenii, Leveill – unknown, probably vegetus.
roburneus, Fr.=var. of fomentarius.†
applanatus, Pers.*
fomentarius, Linn.
nigricans, Fr =var. of fomentarius.
ignarius, Linn.
fulvus, Scop. (not Fr.)
pectinatus, Kl.—European form=ribis.
conchatus, Pers =salicinus.
Lonicerae, Weinm.=ribis.
evonymi, Kalchb.=ribis.
ribis Schum.,
salicinus, Pers.
cinnamomeus, Trog.=fulvus.
ungulatus, Schæf.
pinicola, Fr.=ungulatus.
marginatus, Fr.=ungulatus.
rufopallidus, Trog.=roseus.
roseus, Alb. & Schw.
Demidoffii, Lev.=Trametes pini or its variety.
ulmarius, Fr.
gelsorum Fr.—not valid.
cytisinus, Berk.—unknown, probably fraxineus.
connatus, Weinm.=populinus.
fraxineus, Bull.
variegatus, Secr.—unknown, probably ungulatus.
carneus. Nees—European form=roseus.
castaneus, Fr.—unknown, very doubtful.
annosus, Fr.
populinus, Schum.
Neesii, Fr.—unknown, very doubtful.

RESUPINATE.

medulla–panis, Pers.
medulla–panis var pulchellus, Schw.
megaloporus, Pers.
lævigatus Fr.=resupinate fulvus.
obducens Pers.=resupinate populinus.

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†"There exists no original specimen of this species in Fries' herbarium. According to his diagnosis and certainly according to specimens of several authors, it is a variety of fomentarius. However, Fries' illustration (Ic. t. 184 f. 2) is an exact picture of the stratified form of roseus."—Bresadola.

rufoflavus, Berk.
Braunii, Rab.=rufoflavus.
rubriporus, Quel.
Pfeifferi, Bres.*
Hartigii, Allescher.
thelephoroides, Karst,—unknown.
spongiosus, Pers.
tenuis, Karst.=spongiosus.
robustus, Karst.—unknown.
resinaceus, Boud.=var. of laccatus.
carnosus, Pat.—imperfectly known.
hippopus, Willd.—imperfectly known.
gelsicola, Berl.=australis.
leucophæus, Mont.*
laccatus, Kalchb.*
fucatus, Quel.=Polyporus gilvus.

48—NOMENCLATURE.

Finding that I have a couple of pages of "copy" to supply to fill out this pamphlet, I will take the opportunity to "fill in" with a few remarks on the subject of nomenclature. I am well aware that my views on the subject are not in accord with most botanists and that probably they will not be acceptable to the majority of the readers of this leaflet. I have noticed several criticisms of my failure to give the names of authorities after the names of plants and these criticisms are not unexpected. I have only to say concerning the subject that the omissions are made with design. I see no more reason why one who describes a plant should attach his name to it and cumber the pages of literature for all time with it than should one who discovers a new star, a new element, a new chemical compound, a new shade of color or a new anything else. It is necessary that the object should have a name, but it does not follow that it should be entangled for all time to come in print of every description with the name of its namer.

The personality of the man who chanced to stumble over it or who first described it, is neither useful nor necessary. We all appreciate the great, and I believe to a large extent unnecessary, useless weight our study carries in the form of synonyms, and know that several sets of rules have been evolved to govern the naming of plants. The trouble is botanists are not agreed on any set of "rules" nor in my opinion can any be formulated that will remedy the matter,

until botanists become scientists to the exclusion of their personalities. I therefore advocate the taking away of the main *inducement* (as I see the matter) to make synonyms. There is no question but that many writers are fond of seeing their names after a plant. Is it not a standing "reward" offered the searcher after "new species," and a strong temptation to make "new species" on very slight differences? Let us omit the personality after the name of a plant and use it only in connection with the bibliographical citation after *synonyms*, and I believe that authors will be less free to propose new names unless they feel pretty sure of their ground. I will state that I do not expect by voicing my opinion to change the general usage of botanists of the world, nor do I desire to quarrel with those who hold views opposed to my own, but in connection with this subject of nomenclature it is due my readers that I should explain my reasons for neglecting to weight my pages with personal names that seem to me to be unnecessary and objectionable. Knowing therefore that I do not accord with most writers and being aware that much can be said on the subject, I simply make this note for the present to "fill in."

49—PHOTOGRAPHS.

The photographs accompanying this issue will be found to be unusually fine; in fact we have selected for description mostly plants that make good photographs. The student of American agarics who fails to subscribe for these photographs as issued is perhaps making a great mistake. They can be secured, as issued, at the slight expense of a dollar every month or two, and you will not feel the cost, but if you wait until the series has grown the expense of securing the back issues may deter you. As over twelve hundred prints have been distributed so far, I can not complain of a lack of appreciation of the work, still I am glad to get subscriptions, as I feel it is the most practicable way to extend the knowledge of our American agarics, and I take a pride in it. I wish again to disclaim any idea of profit in their distribution, for they are sold at *exact cost to me*. Three sets have been issued:

Set No.	1—12	photos,	mostly Lepiotas	$1 20
" "	2—10	"	" Pluteus	1 00
" "	3—10	"	various	1 00

C. G. LLOYD, Court and Plum Sts., CINCINNATI, O.

MYCOLOGICAL NOTES.

BY G. G. LLOYD.

No. 4.

CINCINNATI, O. NOVEMBER, 1899.

50—THE GENUS PSALLIOTA.*

The genus Psalliota is a brown spored genus belonging to the tribe Annulæ and corresponds to Lepiota in the white spored series. Indeed so closely is it related to Lepiota in general appearance that photographs of certain species could not be referred to either genus without other data. The characters of the genus are:

Pileus distinct from the fleshy stem. Gills free. Veil membranous forming a ring. Spores brown.

The genus further agrees with Lepiota in the tendency of the flesh of many species to change of color when bruised. There is a small corresponding genus, Annularia, in the pink spored series which is not recorded in this country, but no corresponding genus in either the yellow or black spored series.

To our mycophagist friends this genus is of great importance as probably all its species are edible, although doubts have been thrown on comptula. It includes the widely known and universally eaten "campestris" which many persons suppose is the only "mushroom."

The spores of Psalliota are small, elliptical, about 4x5 mc. They vary some in size, but not enough, however, we think, to form distinctive characters. One species (Rodmani) has globose spores.

While the rings of many species of Psalliota are a simple membrane, as we find in many Lepiotas, there are

*Most recent writers call this genus Agaricus. The Linnaean idea of the genus Agaricus was "anything with gills." Fries modified the idea and defined a good genus dividing it into a number of subgenera. Saccardo raised Fries' subgenera to generic rank, adopting Fries' names of the subgenera for all the genera *with the exception of one. Psalliota* he calls *Agaricus*. why? because the first species that Linnaeus happened to list under Agaricus was a species of Psalliota. The name Agaricus has been applied to so many plants that its use is confusing as applied to a plant now. In our opinion it is better to *drop it altogether*. If Linnaeus had formulated any intelligent idea of a genus Agaricus as we know Psalliota now, there would be some claim to retain his name. To continue a Linnaean name, given when he had no idea concerning the genus, and especially when that name has been used so extensively and applied to so many different plants that it has lost all suggestion of distinctiveness is bad. To try to restrict the name now to a small section simply because one plant of that section was "mentioned first, by accident" when we have a good descriptive name that conveys no idea *excepting of that one section* we think is unwise.

also species with peculiar rings which we know in no other genus. In the young plant of Psalliota placomyces a section through the veil is wedge shape. It hangs by its thin edge from near the top of the stipe, the lower thick end being attached to the margin of the young pileus. As the pileus expands, it tears and splits this wedge-shaped veil so that the ring formed from it has the appearance of a double membrane, hence the "duplicatus annulus" of Fries. Our photograph however, (distributed as No. 50) which we select to show this feature, is better as an illustration than the word explanation.

I believe the character of the ring, if correctly observed and recorded, would be a good natural feature by which to subdivide the genus which is one of the few genera Fries did not subdivide on natural relationship.

HABITAT.—All of our native species are terrestrial. Of the species I have met, campestris and its variety grow in manured ground and pastures, the remainder in the woods. Placomyces I have usually found in lawns and woodland pastures, but also in the woods.

LITERATURE.—Stevenson, page 304; Fries' Epic., page 278; Peck, New York Species, 36th Rep., page 41; Peck Edible Species, 48th Rep., page 133 and plates 6, 7, 8 and 9; Smith C. O. Species of Champlain Valley, Rhodora, September, 1899.

51—PSALLIOTA CAMPESTRIS.

Pileus convex–expanded, white or whitish, appressed even silky when young, breaking into fibrillose scales when old. Gills broad, free. pink when young, becoming dark brown, almost black when old. Stem short, equal, stuffed, white. Ring near the middle, small, often torn or disappearing.

The above description is made from the wild plant as it occurs tolerably constant in characters with us. The plant is extremely variable, especially in cultivation, and numerous varieties are named as having pilei brown, reddish, scaly, etc. We received plants from Mrs. Langenbeck which were pure white and smooth. Psalliota campestris, better known perhaps as Agaricus campestris, is the celebrated "edible mushroom" gathered in the fields and pastures in the fall of the year. It is the only species which, to our knowledge, can be successfully cultivated and is raised in considerable quantities by gardeners in the vicinity of all large cities. The cultivated plant, as we notice it in market, is covered with brown scales and is a much darker colored plant than the wild species around Cincinnati. A practicable method of cultivation is explained in detail in Farmers' Bulletin No. 53. It

is a manure loving species, at least it is grown in earth mixed with manure and usually found only in pastures and fields where stock are kept, not in parks or woods. Our photograph represents the constant wild form about Cincinnati. The ring, it will be noticed, differs from the ring of other species photographed in sheathing the stem (peronate). One of our plants photographed admirably shows this character.

52—PSALLIOTA CAMPESTRIS VAR. HORTENSIS.

Pileus globose, then expanded, densely covered with pinkish fibrillose scales. Veil ample, flocculent, thin, forming a large pendulose ring. Gills at first white, then pink, at length reddish fuscous. Stem thick, hollow.

This specimen was a large plant, pileus four to eight inches across when expanded. I have never met it growing, the plant was brought to me by Henry J. Koch, a florist. At first from its large size I supposed it was arvensis the "Horse Mushroom" of Europe, and it agrees well with Fries' plate of this species, but it can not be the arvensis of England as described by all English writers and illustrated by Cooke and others. I am therefore forced to refer it to a cultivated form of campestris, although it seems to me to differ essentially in its veil. It agrees well with Cooke's figure of this variety of campestris.

53—PSALLIOTA PLACOMYCES.

Pileus sub-globose when young, explanate when mature, white, covered with numerous very small blackish brown scales. Gills close, free and somewhat remote, when very young white, as the veil breaks pink or rose color, when mature dark brown. Veil ample, somewhat reflexed, externally floccose. Stem very smooth, thickened somewhat bulbous below, tapering upward, containing a small pith or finally a small hollow. Spores small, 4x5 mc., when fresh nucleate on one side.

In this locality the plant is not rare, occuring in rich soil around yards and fields rather in preference to woods where, however, we sometimes find it. It is a beautiful species, with its white pileus and numerous small, regular dark scales; I know none prettier. When bruised the white pileus turn brown. To the touch the pileus is soft like kid leather. For a description of the peculiar veil see remarks on the genus. We distribute two photographs, one of them undertimed in exposure so that the gills do not show, but it was necessary to so undertime it in order to give the proper effect of the ring and stem as well as the top of the pileus of the accompanying plant. Professor Peck describes the scales as brown but illustrates them yellow. With us they are very dark brown, almost black, and contrast strongly with the white pileus.

54—PSALLIOTA SILVATICA.

Pileus explanate, even, *densely* covered with fibrillose appressed brown scales. Flesh white, slowly becoming brownish when cut or bruised. Gills free, pink when young, *dark* when old, broader behind. Stipe nearly *equal*, slender,

white, smooth, hollow. Veil white, large, forming a reflexed ring on the stem.

This plant was found late in the season in rich leaf mold in the woods. The prominent characters of the plant are the densely scaly pileus and the nearly equal stem. I had some trouble in determining the plant, owing to its departure from Cooke's figure, but Bresadola has confirmed it, and we note that he states that Cooke's plate is probably P. perrara. Our plant agrees well with recent plate in Fungi Tridentini, It will be noticed that our plant does not accord to description in 36th Rep., and in Rhodora, pileus with a "*few* appressed scales." Either the Eastern and Western plants vary much in the nature of the scales, or Prof. Peck, Burt and myself have applied the name to different plants. The plant is recorded by numerous observers, but it is rare here and we have never found it but once.

55—PSALLIOTA SILVICOLA.

Pileus convex-expanded, *pure white*, almost smooth, a few silky white fibrils only. Gills rose color when young, light brown when old, free, rounded behind ("acute behind" —Stevenson). Ring large, loose, flocculent outside, flabby. Stem long, smooth. white, stuffed, cobwebby then hollow, bulbous at the very base.

The plant is found only in woods. The books describe it as white or yellowish and Cooke's figure is decidedly yellow. Our plant is pure white but developed a yellow tinge when put in alcohol. Vittadini's original figure is white, also Richon and Rose's plate, which is an exact reproduction of the plant as we find it!

The plant is characterized by the smooth pileus and the peculiar bulb at the base. Another white, smooth species grows in Europe, cretacea, (reported from this country probably based on this species) but it is found in fields and has a different stipe.

56—PSALLIOTA COMPTULA.

Pileus explanate, yellow, darker at the disk, fibrillose, the free ends of the fibrils forming appressed scales. Flesh white, thin. Gills free, close, dark brown, becoming black. Stipe yellowish, stuffed then hollow, slightly thickened at the base.

It grows solitary or somewhat gregarious in woodland pastures or open woods. I frequently find it and note it mentally as "the little yellow psalliota." It is the only small species I have met and is rarely over 5 cm. broad. Burt finds the plant in the East corresponding very closely to the European species in color, viz., white, somewhat cream colored disk, but all the plants we have seen were pure yellow, without, however, any reddish or brownish tinge. It seems to be rare in the East, being recorded by only Burt, Peck and Banning, but we have collected it several times.

57—PSALLIOTA EXSERTA.

(doubtful determination.)

Pileus expanded, white, smooth, the *flesh turning red when bruised.* Ring remote, thin, flabby, floccose beneath. Gills free. Stem slender, stuffed then hollow, equal or slightly thickened at the very base. This plant is found in the woods but is rare here. The determination is very doubtful, being based

solely on the description in Fries' and that too without access to the plate of Viviani. I fail to see the application of "exserta" if ours be the plant. The feature of the plant is the *red spots* that appear on the pileus when bruised. There are two other species reported from this country, hæmorrhoidaria and maritima, the flesh of which turn red when bruised, but our plant can be neither of these.

Synopsis and notes on species of Psalliota recorded from this country.

58—Psalliota achimenes, described fifty years ago from dried specimens and not recognized since. Very similar to the plant we now know as placomyces, but pileus said to be "studded with warty excrescences."

59—Psalliota argentea, a small species, described from dried specimens having pileus "grayish white or grayish brown, shining with a silvery luster when dry" (See Bull. Torr. Club, 1899, page 88).

60—Psalliota amygdalina, listed by Curtis, never described.

61—Psalliota arvensis, the "horse mushroom" of England. A *large* white or yellowish, smooth species with a large radiating split ring (see Stevenson, page 305). Frequently recorded and rather common in the East, but I have never seen it, although it was "identified" among some dried specimens sent Berkeley from Cincinnati.

62—Psalliota bulbosa, a large pale yellow species, described from California. Very suggestive of "arvensis."

63—Psalliota Californica, described from dried specimens from California (see Bull. Torr. Club, Vol. 22, page 203).

Psalliota campestris (see No. 51 preceding).

Psalliota comptula (see No. 56 preceding).

64—Psalliota cretacea. Recorded by Curtis, Harkness and Peck only in his earliest reports (omitted from Peck's later reviews). Determinations probably based on silvicola (which see).

65—Psalliota diminutiva, a small species, very close to comptula, described by Prof. Peck, but having reddish or brownish hues (see 36th Rep., page 49).

66—Psalliota echinata, a small European species (see Stevenson, page 308), recorded only by Schweinitz, "rare in green houses," North Carolina.

67—Psalliota elvensis, a European species (see Stevenson, page 304), recorded on very doubtful authority.

Psalliota exserta, doubtfully determined (see No. 57 preceeding).

68—Psalliota fabacea, described by Berkeley (see Lea's Catalogue), from dried specimens as having *a viscid pileus*. Very common in early days, judging from the fact that Berkeley recognized it in three collections (from Sprague, Lea and Curtis). Not recognized last fifty years, probably due, we think, to it having been misdescribed "*with a viscid pileus*."

69 - Psalliota fœderata, described forty years ago, from dried specimens not recorded since. Probably based, we think, on the plant we now know as comptula, but said to have "striate margin" (who knows a *striate* Psalliota?) and pileus granular with white squamules (who knows a *granular* Psalliota?).

70—Psalliota hæmorrhoidaria. (See Cooke's illustration and Stevenson, page 307). This European species called the "bleeding mushroom," from the flesh turning red, is a large scaly species and rare in this country, being recorded only by Clements (Nebraska) and Peck (45th Rep.).

71—Psalliota magnifica, a large species, described from dried specimens from Pennsylvania (See Bull. Torr. Club, 1899, page 68).

72—Psalliota maritima, a species with "maritime habits." The flesh of the pileus turns red when bruised (See Bull. Torr. Club, 1899, page 66).

Psalliota placomyces (See No. 53 preceding).

73—Psalliota Rodmani, a smooth, white species, resembling "campestris" in size nad general appearance but distinct in its narrow gills, solid stipe, globose spores and peculiar collar (See 48th Rep., plate 9).

Psalliota silvatica (See No. 54 preceding).

Psalliota silvicola (See No. 55 preceding).

74—Psalliota subrufescens, a rare species in wild state (only once met with by Prof. Peck) but found abundantly in a green house by Wm. Falconer

(See 48th Rep., page 138). It seems very close to cultivated forms of campestris, differing in the unchangeable flesh and the floccose-squamulose ring (See 48th Rep., plate 7).

75-Psalliota tabularis, described from Colorado, dried specimens. Strongly characterized by "deeply rimose-areolate pileus, the areolæ pyramidal, truncate" (See Bull. Torr. Club, Vol. 22, page 203).

76—Psalliota xylogena, a yellow species, described from a drawing sent to Europe 40 years ago as *growing on wood*. A few rare species do grow on wood but save this none are known in our country and no one has ever recognized this one since it was described 40 years ago.

77—Synonyms used in connection with the American genus.

Psalliota edulis=Psalliota arvensis.
" exquisita= " "
" Hornemanni=Stropharia Hornemanni.
" Johnsoniana= " Johnsoniana.
" pratensis=Psalliota campestris (form).
" semiglobata=Stropharia semiglobata.
" stercoraria= " stercoraria.

78—LEPIOTA RACHODES.

(See Myc. Notes, No. 40.)

Pileus, when young, covered with an even, smooth, brown, continuous cuticle which, as the plant grows, separates (excepting on the disk) into loose scales that fall away leaving the surface much torn with fibrillose scales. The outer cuticle remains entire at the disk. Flesh white, turning reddish when bruised. Gills free, remote, white. Ring movable. Stem stout, strongly bulbose at the base, *smooth*

We are indebted to Geo. B. Fessenden, President of the Boston Mycological Club, for fresh specimens from which our notes and photographs were made. The plant seems to occur only in the Eastern States There is no question of the correctness of the determination. The plant agrees well with Vittadini's plate and description, and Bresadola confirms it. Cooke's plate was evidently made from the same species but is a poor illustration of it. In this country there has been much confusion about the species. The "rachodes" of early American workers is the plant we now call Americana (See No. 8). Frost seems to be the first to correctly identify it, but both plants grew with him. Save in its property of turning red when bruised it has little in common with Americana but is very close to procera. It differs from procera in its smooth stem, in the entire absence of an umbo, and in the more ragged surface of the pileus when the outer cuticle has peeled off (hence the name rachodes from a Greek word meaning a ragged garment). Our photographs of the two species would indicate a marked difference in rachodes having a large bulb at base of stipe, but I am advised by Mr. Fessenden that this feature is not constant. The following notes from Mr. Fessenden are from observations on the growing plant. "I have seen large specimens with stipes 2½ inches in diameter and shaped like an onion stalk, but this shape is unusual. The pileus does not turn red at once by bruising but the stipe does. I think it turns as quickly as Americana, although the flow of the juice is not quite so profuse. When young the pileus is more globose than procera and when mature is slightly depressed or perfectly even at the disk. It is gregarious in habits. We usually find several growing together at the base. I have observed that it grows in exactly the same locality year after year and increases in quantity each year. It comes early and lasts until the ground freezes. It is an edible species and on account of its persistent recurrence from the same mycelium I think it could be successfully cultivated."

79--The Genus Volvaria Again.

(See Myc. Notes, Nos. 15, 38 and 39.)

We present additional photographs of two species.

80—VOLVARIA PUSSILA.

Fig 1.
Volvaria pussila.

At the time we described this plant (see No. 18) we had no good photograph from nature and reproduced a European plate. We are glad to publish a photograph showing well this little species and its peculiar four parted volva.

81—VOLVARIA VILLOSAVOLVA

Pileus convex, even, dry, silky fibrillose, somewhat rimose, gray. Gills free, remote. Stipe solid, pure white, smooth, slightly tapering upward. Volva globose, densely covered with long, white myceloid hairs. Spores globose, 5 mc.

Fig. 2.
Volvaria villosavolva.

We found this plant growing attached to fallen leaves and rich earth in a damp ravine in the woods. The abundant white myceloid hairs which extend up and cover the volva are its prominent characters. They are very tender and dry quite quickly. When the plants were gathered and before we could get them home to photograph, the tender hairs had disappeared from our best specimen, the middle one in the photograph, though well shown on the small specimen on the right, the one here figured. We have seen this species but once, but then found quite a colony of them, every one strongly characterized by the white myceloid hair. Had this plant been described from a dried specimen its *characteristic feature* would have been omitted.

82—DRIED SPECIMEN DESCRIPTIONS.

We note in a recent Bulletin of Kew Gardens, that Massee has published a number of "new species" of Agarics from dried specimens sent from the Straits Settlement and other Colonies. What a lot of trouble is in store for the future workers in those countries when they attempt to identify the growing plants from these descriptions! If Prof. Massee realized the terrible jumble American mycology is now in thanks to the misdirected efforts of Berkeley, Montagne and others to describe our plants from dried specimens we can not believe that he would continue this line of work. We take no exceptions to "new species" from dried specimens of plants that retain their characters when dry, such as Gestromycetes. most Polyperii, etc, but in the case of Agarics we feel and candidly state that nine-tenths of the descriptions are not only useless but worse than useless.

Our synopsis of Psalliota in this pamphlet illustrates this fact. Four species of Psalliota were described by Berkeley and Montagne forty to fifty

years ago from dried specimens sent from this country. *Not a species so described* has been recognized in the field by any worker with American Agarics. Montagne so described fifty or more agarics from Columbus. If Prof. Peck has ever recorded any of them in his thirty years collections we have overlooked his record. Does anyone believe that fifty agarics grew about Columbus, O., and that a large percentage of them do not occur in New York? Why should our literature be burdened with such descriptions?

83—MANUAL.

Workers with Myxomycetes are to be congratulated on the splendid hand book, "The North American Slime-Moulds," which has just been issued by Prof. Macbride. Why can we not have a manual of Agarics? We believe that but one man in this country, Prof. Chas. Peck, has a wide and critical knowledge of growing agarics, and we hope he can be induced to give us a manual. Prof. Peck's knowledge of the growing plants would be invaluable if presented in a complete form, and the interest in the subject is such now that the book would be issued at a profit. Prof. Peck has worked thirty years with the agarics of New York and knows them as does no other man and we repeat that a book embodying his observations concerning the growing plants would be the greatest boon that American students could have.

84—NOTES.

We note with pleasure in the April number of Rhodora, a paper on the Vermont Helvellæ by Prof. E. A. Burt. Nothing can aid our knowledge of our native fungi as much as the systematic description of specimens occurring in localities, and we are in hopes to see more work of the same nature from Prof. Burt's pen.

Calvatia aurea (vide Myc. Notes, No. 22), seems to be a widely distributed plant. We have received specimens from Edward P. Ely, of Connecticut, and from Dr. Gladfelter, of St. Louis. We have sent specimens to the leading mycologists of Europe who do not recognize it as anything with which they are familiar. We feel sure that it is an American species. The only question is, is it not rubroflava of Cragin, but at the time we thought it was a different species because it was of different shape from that species as described. We hope our readers will send in any yellow puff ball they may meet, for by comparison with specimens from different localities we may be enabled to form an opinion whether there are one or two yellow puff balls in this country.

THE SOUTH SEA ISLANDS.

By the time this leaflet reaches our readers, the writer will be well on his way for a winter's trip to Samoa and other South Sea Islands. Arrangements have been made however so that the photographs can be ordered and will be sent out in our absence.

85—PHOTOGRAPHS.

We feel that the photographs that we are sending out at cost are doing much good in advancing the study of our native agarics. 1594 prints have been distributed. Four sets are now offered,

Set No. 1	—12 photos,	mostly Lepiota	$1 20
" " 2	—10 "	" Pluteus	1 00
" " 3	—10 "	various	1 00
" " 4	—10 "	mostly Psalliota	1 00

C. G. LLOYD, Court and Plum Sts., CINCINNATI, O.

MYCOLOGICAL NOTES.

BY G. G. LLOYD.

No. 5.

CINCINNATI, O. DECEMBER, 1900.

86—COLLYBIAS OF CINCINNATI.

The essential character of the genus Collybia are white spores, cartilaginous stem, convex-explanate pileus, and margin of the pileus incurved when young. It is a common genus and every collector will meet a number of species. It is also one of the easiest genera we have to work with, and I have never experienced the trouble I have met with the allied genera Clitocybe and Tricholoma. Most of the species of which the common dryophila is a type, are readily recognizable by the strongly cartilaginous stem and convex-explanate pileus. C. platyphylla, also a common species with a fleshy stem (of which the cuticle is said to be cartilaginous), is more apt to be looked for in the Tricholomas. C. stipitaria, a little species with setiform stem and pileus not putrescent but reviving under the influence of moisture, would probably be looked for in Marasmius, but C. confluens with its tough reviving pileus, I take to be a much better Marasmius. Although a common plant here, I did not locate it for several years, for I did not think to look for it elsewhere than in Marasmius.

Fries divides the genus primarily by the color of the gills, viz:—

Gills white or bright colored.

Gills cinereous.

We have met but one species belonging to the second section.

Prof. Peck, in his excellent monograph of the New York species, introduces the character of hygrophanous pilei, but as he places such species as dryophila and butyracea among the non-hygrophanous species (whereas we would consider them hygrophanous), we think it better to disregard the division and simply divide the species by the purely artificial character of the nature of the stem, which is very evident in all the species we have met.

Striaepedes. Stem stout, grooved or striate.

Laevipedes. Stem slender, equal, even, glabrous (the base excepted).

Vestipedes. Stem slender, equal, velutinate, tomentose, floccose or pruinose.

LITERATURE.

Fries' Epicrisis, p. 109. Stevenson, Vol. 1, p. 96. Peck's Monograph of New York Species, 49th Report. The last a most useful work for the American student.

SECTION 1.—STRIAPEDES.

KEY.

Gills broad, distant.*
Gills narrow, close.†
*Stipe long, rooting. . . . . radicata.
*Stipe not rooting, fleshy, thick. . . . . platyphylla.
*Stipe not rooting, strict, strongly striate. . . . . striatulata.
†Color fuliginous smoky. . . . . fuliginella.
†Color reddish brown or tan. . . . . butyracea.

Fig. 3.
Collybia platyphylla A small plant.

87—COLLYBIA RADICATA.

For description see Myc. Notes, No. 45. (Photograph 45.)

88—COLLYBIA PLATYPHYLLA.

Pileus fleshy, fuscous-cinereous, convex, then plane, or frequently when old the margin recurved; streaked with fibrils. Gills broad, distant, white, adnexed, usually emarginate. Stem thick, stout, fleshy, fibrillose-striate, whitish, stuffed or hollow.

This is a frequent plant usually about stumps or on very rotten logs. It varies much as to size, as shown in our two photographs, but

is constant as to color, well shown in Cooke's plate, which I consider one of the truest plates in his series. Sometimes in wet weather the fibrils (mostly) wash off. This is an anomalous species in the genus Collybia, and it is questionable if it is not a better Tricholoma. It is more apt to be looked for among the Tricholomas. The plant described by Prof. Peck as Tricholoma præfoliatum and the plant referred by him to Tricholoma hordum are, Prof. Peck states, really forms of this species.

Fig. 4.
Collybia striatulata, (natural size.)

89—COLLYBIA STRIATULATA, p. t.

Pileus convex, then explanate, hygrophanous, light brown when wet, much lighter when dry, *strongly striatulate when wet*, smooth. Gills broad, distant, attached. Stem long, hollow, fragile, strongly striate, smooth.

I am very doubtful about this plant, as when wet it differs from all others I know in its strong striatulation. Collybias are usually but faintly striatulate, if at all. The striatulations suggest the genus Mycena, but the plant has the collybia shape. I did not notice any odor when collected, though I probably would not have done so had there

No. 5,
Collybia fuliginella,
(natural size.)

been one. I would refer it to alcalinolens if any note had been made of the strong striatulations (almost grooves) on the stem, as shown in our photograph, which are *the features* of the plant. It is evidently a rare plant here as I have seen it but once. The plant grew in rich leaf mould. Our photograph is strongly characteristic and cannot be confused with anything else, and if it has been described will enable future workers to decide without question the plant under consideration. The hygrophanous pileus shows well in our photograph, though not in the plant figured.

90—COLLYBIA FULIGINELLA.

Pileus explanate, smooth, even, fuliginous color, with a small umbilicate depression in the disk. Gills adnexed, slightly decurrent, narrow, light smoky color. Stem equal, or tapering up, concolorous with the pileus, striate, stuffed or hollow, white myceloid tomentose at base.

A few plants were found growing among some chips in the woods. The gills were not "white" and not "nearly free," but the plant agreed with the description in all other respects and on account of its peculiar sooty color I have no doubt of its determination.

Fig. 6.
Collybia butyracea, (natural size.)

91—COLLYBIA BUTYRACEA.

Pileus convex then expanded, even, smooth, rufous brown becoming pale. Flesh somewhat hygrophanous, dingy white when moist, white when dry. Gills narrow, close, white, adnexed or almost free. Stem rigid, tapering upward, striate, reddish-brown, usually white myceloid tomentose at base.

This plant is rather rare, growing in rich leaf mould, sometimes on rotten logs. The pileus and gills are very similar in shape and color to dryophila, but the plant differs entirely in its stem. I have, however, received alcoholic specimens from a very good collector labeled "dryophila," which shows that it is liable to be confused.

SECTION 2.—LÆVIPEDES.

KEY.

Plant lilac color . . . . . myriadophylla.
Plant yellow.*
Plant not lilac color or clear yellow.†
***Plant on decaying wood. . . . . colorea.**
***Plant in leaf mould . . . . . dryophila.**
†Stem white . . . . . strictipes.
†Stem not white.‡
‡Plant cæspitose, gills white . . . . . acervata.
‡Plant cæspitose, gills rufous . . . . . acervata var. lachnophylla.
‡Plant gregarious or solitary . . . . . dryophila.

92—COLLYBIA MYRIADOPHYLLA.

Fig. 7.
Collybia myriadophylla, (natural size.)

Pileus hygrophanous, thin, convex-plane, *lilac* color when fresh, brownish when dry, even, (not striate or striatulate.) Gills *very numerous*, close, lilac color. Stem equal, slender, lilac color, minutely scurfy.

This plant is very rare, but I have collected a few specimens on several occasions, always growing on logs. Prof. Peck ascribes brown or reddish-brown color to pileus and stem and lilac color to gills. Our specimens were peculiar in being almost concolorous, a beautiful distinct lilac color. They are also larger than original description. We have placed this with the smooth stem species, but the stem when dry is very minutely scurfy. The *very close numerous* gills (the plant is well named), have a glaucous appearance when turned to the light.

93—COLLYBIA COLOREA.

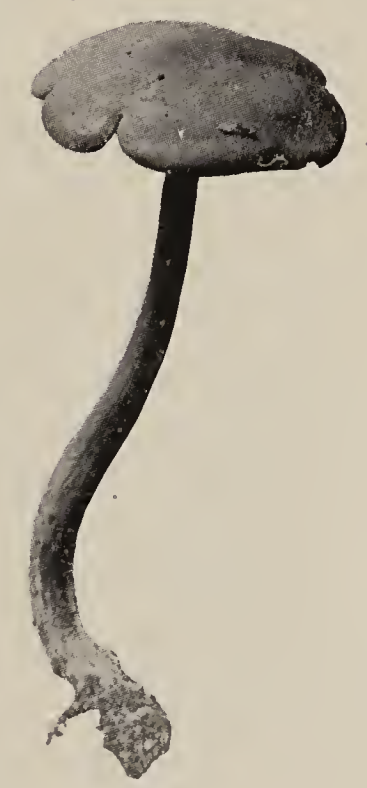

Fig. 8.
Collybia colorea, (natural size.)

Pileus plane, even, (not striate), smooth, uniform, dark yellow, margin slightly incurved, exceeding the gills. Gills *yellow*, narrow, close, attached. Flesh of pileus and stem yellow, that of the pileus slightly darker than the stem. Stem tough, cartilaginous, straight, smooth, hollow, yellow, slightly white myceloid at the base.

This plant is peculiar in being *yellow* in all its parts. The pileus is slightly hygrophanous, drying lighter in color but turning reddish-brown when exsiccated. It grew only on rotten wood, and I have collected it but a few times. I do not question but that it is the same as C. luteo-olivacea, B. P., but prefer to use Prof. Peck's name applied to a growing plant rather than Berkeley's previous but imperfect (dried specimen) description.

94—COLLYBIA STRICTIPES.

Fig. 9.
Collybia strictipes, (usually solitary.)

Fig. 10.
Collybia strictipes, (young plant.) Stem rarely striate as here shown.

Pileus convex or explanate, even, smooth, hygrophanous, pale reddish color with *darker reddish spots*. Flesh white. Gills very narrow, close, adnate. Stipe pure white, even, smooth, hollow.

It grows singly or several together attached by copious mycelium to moist leaves. In the first specimen collected, the photograph of which we present, the plant was more cæspitose than we have since found it, and the young stem was distinctly striate, as shown in our figure, which would throw the plant to the previous section. We have had opportunity to since observe it rather frequent and have not found any striate stems. The pileus is very peculiarly spotted, by which the plant will be recognized. These spots are similar to those shown on the illustrations of maculata, but the stem differs essentially from that species.

95—COLLYBIA ACERVATA.

Pileus convex, fleshy, obtuse, glabrous, even, reddish-brown, hygrophanous, slightly striate when wet. Gills narrow, close, white, adnexed or free. Stipe rigid, slender, very smooth, reddish-brown below, lighter color above, white just below the pileus, white myceloid at the base, the mycelium usually growing in patches on rotton leaves.

Our plant is cæspitose on damp, rotten leaves. That it is the plant of Prof. Peck we are assured, as we have an alcoholic specimen of his collection with which it agrees in all respects. It is hardly the plant Cooke figures, differing particularly in the stipe never being so large, but Cooke, in Grevillea, throws doubt on his own figure.

Fig. 11.
Collybia acervata var. lachnophylla.
(natural size.)

96—COLLYBIA ACERVATA VAR. LACHNOPHYLLA.

Same as previously described species excepting the gills are densely covered with minute rufous stiff setæ.

This plant has quite a history. While we are doubtful about the determination of the previous plant we would surely call this a variety of it, as (for a number of years) we indiscriminately collected it for the same plant until our attention was called to the setæ on the gills. Berkeley many years ago described it as Collybia lachnophylla and Prof. Peck as Collybia spinulifera. Bresadola claims that the plant is the same as Mycena cohærens of Persoon, and that this species in Europe has the same setæ on the gills. We suspect this is where the plant will finally rest, although it is difficult to convince ourselves that Cooke's figure (Marasmius cohærens) and Fries' figure (Mycena cohærens) correctly depict it.

The plant is very frequent in our woods, growing over deep rotten leaves. Prof. Peck states "gills darker with age." My observations are just the reverse, quite dark when young but much lighter when mature. He also states pileus adorned with minute colored setæ, and Berkeley describes the pileus as velutinate. I could not detect setæ with a lens on the pileus, though they are very evident on the gills and the stem, especially when young. It is probable the pileus varies in this respect.

97—COLLYBIA DRYOPHILA.

Pileus fleshy, convex-plane, smooth, reddish or tan color (yellow in a variety), margin even or sometimes irregular. Gills crowded, narrow, adnexed, white or pale, (yellow in a variety.) Stipe smooth, hollow, strongly cartilaginous, equal or slightly thickened below, same color as pileus.

Fig. 12.

Collybia dryophila. (Natural size, but pilei more uneven than usual.)

This is our most common species and variable. It grows in woods, rarely on logs, usually on the ground, sometimes in grass in woodland pastures. The pileus is even, or irregular as shown in our photograph. We have seen a form with the stipe bulbous at the base, also at Preston, Ohio, a form clear yellow, concolorous, stipe, pileus and gills. The pileus is somewhat hygrophanous, the young plants especially if developed during a wet day being much darker (brown) than the mature dry plant.

SECTION 5—VESTIPEDES.

Pileus strongly viscid. . . . . velutipes.
Pileus dry or faintly viscid.*
  *Plant yellow . . . . . tenuipes.
  *Plant not yellow.†
†Pileus smooth . . . . . hariolorum.
†Pileus hairy.
  ‡Gills cinereous. . . . . borealis.
  ‡Gills white.§
§Plant small (pileus about 1 cm.) . . . . . stipitaria.
§Plant larger (pileus 3 to 6 cm.) . . . . . zonata.
§Plant intermediate. . . . . stipitaria var. robusta.

98—COLLYBIA VELUTIPES.

Fig. 13.
Collybia velutipes, (natural size.)

Pileus yellow-tawny, convex then expanded, sometimes slightly excentric, irregular and repant. Viscid, in wet weather thickly covered with gluten. Gills somewhat distant, white, becoming pale yellow, broad behind, adnexed with a deep sinuosity so as to appear free. Flesh yellowish. Stipe densely velvety villose, deep umber or black, equal, slightly striate, stuffed or hollow, fibrillose within.

This plant has a peculiar liking for cold weather and can be found late in the fall and early in the spring. It is seldom found in summer. It grows commonly cæspitose on old logs, sometimes in the ground at base of stumps, but in these cases is usually attached to a buried root or stick. It is a common plant, and from its habits of growing in cold weather and its viscidity is readily recognized.

We have two Agarics around Cincinnati that we are more apt to find in cold weather, viz: Collybia velutipes and Mycena tintinabulum. Dr. Herbst notes another of similar habits at Trexlertown, Pa., viz: Flammula rigida. We also frequently met Pleurotus sapidus in cold weather, though not so abundant as in summer.

99—COLLYBIA TENUIPES.

Pileus expanded, flat, very slightly viscid, smooth, yellowish-brown color, margin striate. Flesh yellow. Gills broad, pale yellow, rounded behind, *strongly venosely connected*. Stipe dark brown (almost black below, lighter brown above), minutely densely velvety, stuffed or hollow, tough, strongly cartilaginous. I find this plant about Cincinnati almost every season, usually in May or June. I have also seen it in the Cumberland Mountains. Its features are the strict, tough, slender, velutinate stem, the yellow gills, and especially the strong venose connection between the gills. It usually grows somewhat gregarious on logs. It is closely related to velutipes (more closely than generally supposed since a knowledge of the growing plant shows it to be very slightly viscid), but differs in its slender stem, its slight viscidity, and its mode of growth (hardly cæspitose.) I have described the pileus as smooth, for though it has a velutinate appearance to the eye, well shown in our photograph, no hairs are shown even with the microscope on the specimen at hand. I have such a strong impression, however, of having collected it with pileus velutinate that I suspect it varies in this regard.

Fig. 14.
Collybia tenuipes, (natural size.)

This is one of the few American agarics named by Schweinitz. Peck has redescribed it from dried specimens under the name Collybia amabilipes. Prof. Morgan informs me it is the plant on which his record of Agaricus cerinus was based.

Fig. 15.
Collybia stipitaria.
(Natural size, short-stem form.)

100—COLLYBIA STIPITARIA.

Pileus expanded, plane, umbilicate, under a glass squamulose with appressed tawny hairs arranged somewhat in zones. Stipe slender, tough, dark brown, shaggy fibrillose. Gills white, separating free, broad (relatively), distant (relatively.)

It is liable to be taken for a Marasmius, as it has the Marasmius habit of reviving with moisture after having dried up. Its usual habitat is dead grass culms or twigs in woodland pastures.

The form photographed, which grows in the open on grass culms, has much shorter stem (2-3 cm.) than the usual form in woods (var. setipes), which has stem 6 to 9 cm. long. On a very wet day I have seen in the open the pileus almost white with a dark center and expanded so tensely as to become striate. Normally it is darker color and not striate.

Some recent European writers are disposed to use Bulliard's name "cauticinalis" for this plant, but personally we do not favor displacing a well established name in common use for a plant, solely on the grounds of "priority."

101—COLLYBIA STIPITARIA VAR. ROBUSTA P. T.

It is stated (Myc. Notes, 43) that Collybia zonata seems to be an enlarged edition of C. stipitaria in fact it has all the characters excepting size. I am perfectly familiar with both plants growing around Cincinnati, and have never in this locality seen any forms connecting them. This summer, in northern Michigan, growing on fallen cedar limbs in a swamp, I found a plant that I could not refer to either. It seemed to be exactly intermediate. We present a photograph, and it is not necessary to further describe it. The description of the color and zonate hairs of either stipitaria or zonata covers it. For the present we call it a form of stipitaria, as between the two it is closer to this plant in size, though it might not be thought so from the figures we present. Our figure of zonata is of a very small specimen.

Fig. 16.
Collybia stipitaria var. robusta,
(Natural size.)

102—COLLYBIA ZONATA.

This plant has been described in these notes (vide No. 43.) The opinion of Prof. Bresadola expressed that this plant is a large form of stipitaria is strongly confirmed in my mind by since finding an intermediate form in Michigan. Still the normal form of the two plants are so widely different in size, that I would call them by different names.

Fig. 17.
Collybia zonata.
(A *small* plant.)

103—COLLYBIA HARIOLORUM.

Pileus white, thin, smooth, expanded or depressed, margin obscurely striate. Gills very numerous, close, narrow, free. Stipe pale, even, hollow, covered below with long, white, loose, woolly hairs.

It grows usually several in a cluster in woods ground. It is not common. The stipe is not as firm as C. dryophila. In drying the hairs of the stipe mat down. A peculiarity of the plant is the

abundant mycelium which covers leaves and twigs at its base.

Stevenson states stipe "for the most part" covered with woolly hairs. In our plant the hairs only cover the lower part of the stipe. Our plant is not so highly colored as Cooke illustrates. We do not present now a figure of the plant, it having been spoiled by the engraver, but one will follow in next issue. Those who secure our photographs, however, will have a splendid illustration of the plant.

104—COLLYBIA BOREALIS, P. T.

Fig. 18.
Collybia borealis, (natural size.)

Pileus hygrophanous, convex-expanded, pale bay, the center dark rufous brown, lighter color when dry, obtuse, even. Gills *cinereous*, *free*, narrow, *close*. Stipe equal, fistulose, bay-brown, *covered with a uniform coat of short villous down*.

These specimens were cæspitose at Hubbard Lake, Mich., on fallen pine needles. It is the first specimen I have met of Fries' Tephrophanæ with cinereous gills. It belongs to his first section but does not seem to be either of his species. Peck has none belonging truly to this section.

When wet the fine soft hairs of the stipe do not show, and in this state might be taken for dryophila, but when dry the different stipe is noticeable at once. The color of the gills would also distinguish it. When dry the pileus is bibulous and under a glass appears as though innately silky.

105—P. T. SPECIES.

The abreviation p. t. added to the names of some of the plants in the previous article mean *pro tempore*, "for the time being." It is added to such plants as I have been unable to determine to my satisfaction, and indicates the name I have adopted until further light is thrown on the subject.

I have strong abiding faith that the greater part of our plants are European species, perhaps cosmopolitan species. That the reason we do not recognize them is due to the inaccurate plates and descriptions on which our knowledge of European plants is based. That the

plates are misleading is self-evident to any one who will compare the various plates issued and said to represent the same plant in Europe. We could cite many cases to demonstrate where it is impossible for the plates to represent the same plant. When you know a plant you often recognize a widely different plate as being intended to represent it, and consequently make mental allowance for the aberrations of the artist. But it is more difficult to reverse the operation, and when you know a plate to reconcile a doubtful plant to it, for you have the probability before you all the time that the plate was never intended to represent that plant. In this connection it is a fact that the only man who has ever worked with American agarics in the field, and who was familiar with growing plants of Europe, referred *ninety-three per cent.* of the plants he met in this country to European species. Last winter, in Samoa, an island separated millions of years from land connection with this country, we saw a number of species persisting there which we recognized as *familiar denizens* of our woods around Cincinnati. Some of them we know only by American names but our faith in their being "American species" was strongly shocked. Every one who studies Agarics in this country will find a number of plants he cannot place. It is a very simple matter to call them "new species" and so describe them, and no doubt some of them will be "new species", but the majority, we firmly believe, are "old species" that we do not recognize from the published description and plates. When we meet such a plant, for convenience we call it by a new or temporary name for the time being, believing that our work will aid in its correct reference in time. We will thank any one for additional light on any of the plants considered in these notes, and especially on any of the "p. t." species.

106—TWO PLANTS WITH PECULIAR SPORES

The size, the measurement of spores appears to me to be too strongly relied upon in the work of some of our present workers. In Fries' days not enough attention was paid to the spores; in our days too much stress is placed upon the size of spores. We do not question that the *shape* of the spores is a constant and helpful character of Agarics, as is also their "general size." For instance, the unusally large spores of Collybia radicata is a character distinguishing this species from other Collybias, but we would not put much faith in a Collybia which differs principally in having the spores one or two micrometers larger or smaller than some other species. In the next place the spores of many species vary much in size in the same plant. Throw on a slide the spores of almost any common Coprinus and you will find often two or three micrometers difference in the diameters. Whether this is due to some spores being immature and others ripe, or whether the mature spores vary I do not know. Again no two observers are apt to measure alike the same spores. Compare the recorded measurements of different observers of the spores of common plants and note the discrepancies.

The general shape, on the other hand, we think is characteristic of the species. The genus Coprinus could be divided into species with globose spores and species with spores not globose. We believe this

holds true notwithstanding that the common plant which everyone takes for "plicatilis" in this country has *globose* spores, while in Europe it is figured and described with *elliptic* spores. Has any one else noticed it? We would rather believe that the American plant is not "plicatilis" than that the spores of the "same plant" should differ so radically in the two countries. The spores of most Agarics have the same general shapes, viz :—globose, ovoid, elliptic, etc., but occasionally we meet a species with oddly shaped spores, and we shall now describe two such plants.

107—MARASMIUS NIGRIPES.

Fig. 19.
Marasmius nigripes, (natural size.)

Pileus membranaceous, slightly gelatinous when wet, convex, becoming plane or usually reflexed when old. White. Gills white or pale rose-color, adnate, venosely connected. Stipe insitial, solid, tough, equal or slightly tapering down and *black* but covered with a dense coat of white mealiness which is easily rubbed off. Spores very peculiarly three or four angled.

This plant at certain wet seasons in the summer is very abundant in our woods, growing attached to twigs or dead leaves. It was described by Schweinitz but does not agree with his description in two particulars. It is not umbonate and the stipe is not subbulbose. Yet, taking into account its abundance and the character of its peculiar black stipe covered with white farinosity, I think it is right to assume as Prof. Morgan has done that it is the plant Schweinitz had in view. It is usually classed as Marasmius, but in talking to Prof. Morgan concerning its peculiar spores and their differences from all other (usually "pip-shape") spores of Marasmius, and its subgelatinous pileus he suggested that it might be a Heliomyces. I sent specimens to Bresadola suggesting this and he replied : "It does not appear from the dried specimen to be a Heliomyces of which the pileus in drying becomes cartilaginous, whilst in your specimen it is membranaceous." Schweinitz did not observe the curious shaped spores of this plant. They are similar to the spores of Tricholoma goniosperma as illustrated by Bresadola (Fungi Tridentini, plate 109), and also, I am informed by Bresadola, to his Nolanea etaurospora, but the shape is rarely met among agaric spores.

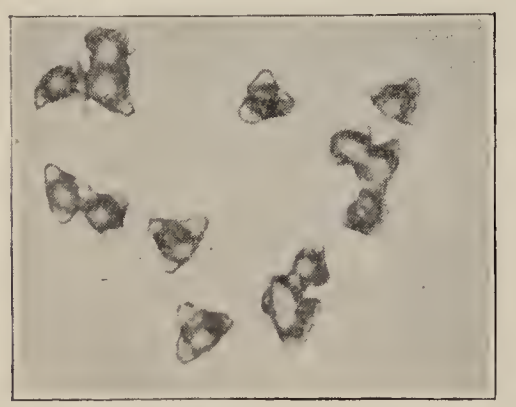

Fig. 20.
Spores of Marasmius nigripes. Micro-photograph by Dr. Edward Thompson.

108—COPRINUS ANGULATUS.

Pileus when young, hemispherical, even, striate, becoming convex and plicate sulcate (it being a veliformes) when mature, smooth,

when young white with ochraceous tints, when partly grown dark gray with a brown (somewhat hygrophanous) center, thin. Gills rather distant, reaching the stem, when mature (but before deliquescing) black

Fig. 21.

Coprinus angulatus, (unexpanded plants, natural size.)

with a white edge. Stipe pure white, equal, hollow, striate, when *very young* evidently white scurfy but appearing glabrous when grown. Spores very peculiarly angular shape like a key-stone, 9x14 mc.

This plant grew on burnt ground in the woods, somewhat gregarious. Quelet describes it "sur les charbonnieres," and I found it growing with Flammula carbonaria and Psathyra pennata, species noted for their preference to ground that has been burnt over. From its peculiar spores and its evident resemblance to Peck's figure of Coprinus silvaticus we do not question its determination, though the original description was from dried specimens and based principally on the spores. Quelet has since described and beautifully illustrated it (Bull. Soc. France, 1877), under the name Coprinus Boudieri. The shape of the spores is likened by Peck to a "very blunt arrow-head, being slightly excavated on each side of the base and gradually narrowed toward the very obtuse apex." Quelet likens them "to a tiara or mitre." It seems to us that a key-stone closest expresses their shape.

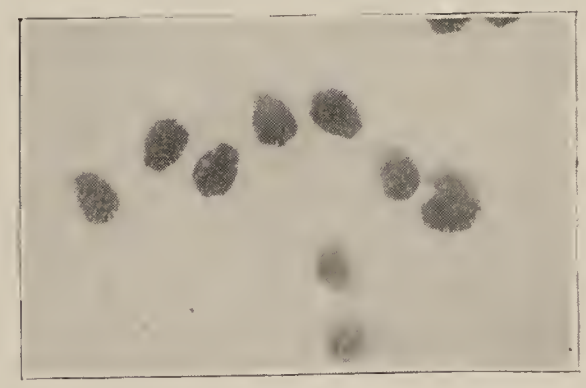

Fig. 22.

Spores of Coprinus angulatus. Micro-photograph by Dr Edward Thompson.

109—A New Work on AMERICAN AGARICS.

Our friend, Dr. Herbst, has most agreeably surprised us in issuing a book of the fungi of his locality, entitled "Fungal Flora of the Lehigh Valley." We have known Dr. Herbst for several years, and while we knew him to be an earnest student of fungi we did not know that he intended publishing a book on the subject. His work we consider the most helpful single volume that has ever been issued on American Agarics, because it considers and describes most of the common plants (those met by everyone.) All who are making a study of fungus should procure it. Send $1.75 to the publishers, Berkemeyer, Keck & Co., Allentown, Pa.

110—NOTES.

At the time we considered Pluteus nanus (vide Myc. Notes, No. 32), we had met it but rarely. This season we have collected it a number of times. It varies much in size and grows both on the ground and on logs. We are now convinced that "Pluteus tortus" (vide Myc. Notes, No. 33) is only a synonym for the plant.

We are informed that the spores of the recently described Clitocybe tarda are *pink*. Hence the plant belongs to the genus Clitopilus.

111—PHOTOGRAPHS.

The figures that we publish in this issue will supply the need of photographs to many who have been subscribing to them. Still we know there are persons who will desire to continue receiving the sets of original prints from our plates. In this connection it is a genuine pleasure to receive such a letter of appreciation as the following:

My Dear Mr. Lloyd:

I am so entirely delighted with a set of your fungus photographs that has just come to me I feel it would be ungrateful not to thank you for the pleasure of owning them and for the wonderful fidelity and beauty of the photographs. I am not yet making a study of the subject, so I cannot yet make these representations useful. I can only appreciate them. No plate that I have ever seen even faintly approaches the marvelous faithfulness of these photographs. It is a joy to see difference of texture, and of structure, so perfectly indicated. One can almost see *color*. I thank you for the privilege of placing in my hands such helps to the study of fungi.

Very sincerely yours,

CORNELIA P. STONE,

Sept. 5, 1900. Hampton Falls, N. Y.

The following sets are now offered:

Set No.	1—12	photos, mostly Lepiota	$1 20
" "	2—10	" " Pluteus	1 00
" "	3—10	" various	1 00
" "	4—10	" mostly Psalliota	1 00
" "	5—10	" mostly Collybia	1 00

C. G. LLOYD, Court and Plum Sts., CINCINNATI, O.

MYCOLOGICAL NOTES.

BY C. G. LLOYD.

No. 6.

CINCINNATI, O. MAY, 1901.

112—DIAGNOSES OF NEW SPECIES OF FUNGI FROM SAMOA.

By Rev. G. Bresadola and N. Patouillard.*

113—COPRINUS MINIATO-FLOCCOSUS.

Pileo submembranaceo, ex ovali campanulato, fulvello, rimoso-sulcato, squamulis miniatis eleganter obsito, glabrescente, 1½ —3 cm. lato; lamellis ex albido fuscis, postice ex adnato liberis; stipite cavo, subconcolore, 3–5 cm. longo, 3–5 mm. crasso; sporis fulvis, binucleatis, nucleis flavis, ellipsoideis, 5–7 x 4–4½ mc. No. 5009.

114—POLYPORUS FUSCO-MACULATUS.

Pileo papyraceo-membranaceo in sicco, flabelliformi, alutaceo-brunneo, squamis saturatioribus, adpressis variegato, 7–8 cm. lato, 4–6 cm. antice producto; stipite laterali, suberoso-molli, alutaceo, 1½–3 cm. longo, 1–1½ cm. crasso, basi haud nigro; tubulis brevibus, vix 1 mm; poris amplis, angulatis, acie demum fimbriatis, generatim 1 mm. latis; sporis hyalinis, oblongis, 8–10x3–4 mc. No. 5004.

Obs. Species haec habitu *Polyporo squamoso* (Huds.) Fr. admodum similis, sed substantia papyraceo-membranacea (saltem in sicco) pilei et spongioso-molli stipitis, stipite basi haud nigro etc., certe ab eodem distincta.

115—PORIA FUMOSA.

Late effusa, griseo-fumosa; subiculo spongioso-membranaceo, ½ mm. circiter crasso, ambitu tomentosulo, sterili; tubulis 1 mm. circiter longis; poris minutis, subrotundatis vel angulatis, saepe e situ obliquo-oblongis; hyphis 3–4 mc. latis; sporis hyalinis, obovato-subangulatis vel semilunulatis, 4 x 2½–3 mc.

Obs. Forma pororum saepe e loco natali pendet; si ad ramos prostratos species crescunt, tunc pori recti, regulares, si vero ad ramos stantes, tunc saepe obliqui, oblongati etc. No. 5042.

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*In a collection of Fungi made on the Island of Upolu (Samoa) were a number of specimens which Mess. Bresadola and Patouillard have decided are new to science. We print diagnoses of these species as prepared by Rev. G. Bresadola. It is probable that in a future number of our "Notes" we will give our memoranda on the collection of the various species, with illustrations of the most characteristic.

C. G. LLOYD.

116—PTERULA FASCICULARIS.

Caespitoso–fascicularis; caespitulis parvis, 1 cm. circiter altis, ½ cm. basi latis; ramulis cartilagineis, filiformibus, simplicibus vel raro hic illic ramosis, sordide gilvis; substantia ex hyphis tenacibus, 3 mc. crassis; basidiis clavatis vel subcylindraceis, 30–35 x 9–10 mc.; sporis globosis, 9–12 mc. diam.

Obs. Pterulae subsimplici, P. Henn, affinis. No. 5012.

117—GEASTER LLOYDII.

Exoperidio membranaceo, 4–6–fido, revoluto, intus brunneo, laeve, extus luride alutaceo, tomentoso–villoso, tomento ex hyphis tortuoso–intricatis, crasse tunicatis, more *Hirneolae polytrichae*, conflato, basi mycelio copioso, radiciformi, albo, prædito; laciniis obovatis, infra medium partitis; endoperidio globoso-obovato, papyraceo, sessili, glabro, avellaneo–umbrino; peristomio indeterminato, piloso fimbriato; capillitio brunneo–fusco, ex hyphis 3–8 mc. latis conflato; columella clavata vel clavato–subcapitata; sporis globosis, laevibus, flavis, episporio crasso, fusco, 3-4 mc. diam.

Obs. Species haec exoperidio tomentoso ab aliis hujus generis speciebus nobis notis optime distincta. Forte *Geastri velutino*, nobis ignoto, proxima. No. 5003.

118—GLOBARIA SAMOENSE.

Peridio sessili, vel subradicato, basi fibrillis micelialibus, albis, copiosis, praedito, utriformi vel obovato, apice ore lacerato, irregulari, dehiscente; cortice externo furfuraceo, umbrino, granulis parvis, saepe pyramidatis, demum deciduis, dense obsito; cortice interno papyraceo, pallide alutaceo; gleba matura olivaceo–fusca, *basi sterili nulla*; capillitio laxo, ex hyphis subhyalinis, 3–5 mc. latis, conflato; sporis globosis, laevibus, fulvis, nucleis flavidis, 3–3½ mc. diam.

Obs. *Globariae furfuraceae*, Schaeff. affinis, a qua forma, indumento peridii, hyphis capillitii etc. optime diversa. No. 5016.

119—HYPOCREA MESENTERICA.

Stromatibus carnoso–lentis, late lobatis, lobis plicato–undulatis, alutaceis, ex ostiolis peritheciorum brunneo–punctatis, intus albidis; peritheciis adpressatis, ovatis, minimis, succineis, immersis; ascis, subcylindraceis, basi attenuatis, 90–100 x 5–6 mc.; sporidiis e duabus cellulis, cuboideis vel subellipticis, 4–5 x 3½–4 mc. compositis, No. 5017.

120—HUMARIA LLOYDIANA.

Ascomatibus carnosis, junioribus basi obeso–substipitatis, bene evolutis sessilibus, explanato–concavis, aurantiacis, glabris, basi albo–fibrillosis, 5–12 mm. latis; hymenio laevi, vivide aurantiaco; ascis cylindraceis, 240–250 x 12–14 mc.; paraphysibus ramosis, 2–3 mc. latis, apice vix incrassatis; sporidiis ellipticis, 1–2–guttatis, hyalinis, 18–20 x 10–11 mc.

Obs. Species haec media inter *Humariam bellam*, B. et C. et *H. laeticolorem*, B. et Br. No. 5019.

121—LLOYDELLA, BRES. N. GEN.

Lloydella, n. gen.= *Stereum*, hymenio *cystidiis* praedito—prouti *Hymenochaete*=*Stereum setulis* praedita.

To this genus should be referred:

Lloydella cinerascens (Schw.)
" *striata* (Schrad.) (=Stereum striatum, abietinum, glaucescens,)
" *Chailletii* (Pers.)
" *spadicea* (Pers.)
" " var. *venosa*, Quel.
" *bicolor* (Pers.)
" *membranacea*, Fr.
" *papyrina* Mont.
" *ferrea* B. & C.

Stereum frustulosum and *St. areolatum* both are rather *Peniophora*.

122—PLEUROTUS SUBPALMATUS.

Pileus rose or pink color, expanded, smooth, or the surface curiously raised into a network of reticulations, when moist somewhat gelatinous. Flesh pink. Gills adnate, pale pink color, (becoming deeper salmon color). Stipe slightly eccentric, fleshy, solid, with flesh pale reddish. Spores white with a faint pinkish-cast, sub-globose 6 mc. minutely echinulate or angular. Very rare, growing on rotten logs. We have met it but once, but we know it has been found in Kansas and Minnesota.

Fig. 23.
Pleurotus subpalmatus, a small specimen.

About fifteen years ago, Prof. Cragin then of Kansas, started out apparently to conquer the whole known field of Natural History. We find him writing papers on Reptiles, Mammals, Ferns, Lichens, Microscopic fungi, Geology, Fishes, Myriapods, Spiders, Mineralogy, Hymenoptera, Conchology, Protozoans and the larger fungi. In the latter field, after an experience covering one or two collecting seasons, he describes a large number of "new species," (most of which work by the way would have been better done if it had not been done at all). Among others the plant under consideration, which although he did not even know its genus, did not deter him from describing it as a "new species,', under the name "Agaricus alveolaris," and he thought that it belonged to the Hyporhodii. Saccardo compiles it under Pluteus. If it belongs to Hyporhodii it would be an Entoloma or Claudopus.

Fig. 24.
Section of Pleurotus subpalmatus.

I am indebted to Mary S. Whetstone, Minneapolis, Minn., for material that enables me to to definitely locate to my satisfaction the plant. When I collected it I did not procure a deposit of spores sufficient to enable me to feel sure of their color. Mrs. Whetstone has saved a good spore deposit for me and I find that the spores are almost white, with a pale rosy tint, not deeper however than we find in the common species "sapidus," which no one has essayed to take out of the "white-spored" species. At the same time the angular shape of the spores are anomalous in the genus Pleurotus and strongly indicate Entoloma. The raised reticulation of the pileus as shown in our illustration are sufficiently characteristic of the plant to enable anyone who may have met this form, to readily recognize it. All plants however, do not have these peculiar reticulations, as is shown in the cross section which we present, and which grew in the same clump as the other, but the plant agreed with it in everything save in these reticulations. Prof. Morgan met and correctly determined the plant many years ago. Prof. Webster records it in the 8th Bulletin of the Boston Myc. Club, but we judge there it is a compilation rather than based on specimens he had met. Cooke's illustration while much larger than we meet is evidently the same plant, but Sowerby's plate (62) which is referred here by Fries and others, cannot possibly be our plant. Pleurotus tremens (Quelet Bull. Soc. Bot. France, 1877), seems to be very much the same with a lateral stipe.

123—COLLYBIAS.

Regarding the illustrations of Collybias in last issue of Mycological Notes, Prof. Bresadola writes:

"Collybia lachnophylla, in my opinion a synonym for Agaricus cohaerens, and has nothing in common with Collybia acervata, which is a form of Marasmius erythropus."

This leaves open the question what is the plant that both Prof. Peck and I have taken for C. acervata? Let us hope to obtain further light on it during the present season.

"Your Collybia borealis is perhaps C. inolens of Europe."—Bresadola.

Carlton Rea, secretary of the British Mycological Society, favors us with a very interesting note on C. butyracea. "Your photograph of C. butyracea does not suggest that plant to my mind as I know it, and it is a perfect pest with us in the autumn months. There is a soapy feel about the pileus which also occurs with Tricholoma saponaceum. Again the stem is cartilaginous and very spongy so that you can press it in and it will spring back in the same way as Clitocybe clavipes. It is stuffed with a few white fibrils and becomes hollow when old."

Mycological Notes are published without subcription price, and we are willing to send to all who are making a special study of fungi. If you will favor us with specimens of your "puff-balls" you will more than repay us.

124—NOTES ON TRICHOLOMA RUTILANS.

Fig. 25.

Tricholoma rutilans, form with pectinate gills.

During a trip that I made to Northern Michigan in the summer of 1899, I met specimens of a plant that I thought was this species, but the gills were *white*, the edges *thin* and *entire*. and on my return home I felt more certain of the determination on looking up Cooke's plate, which is a good representation of the plant I found, not only as to shape, size and markings, but (strange to say) as to *color*. Still Fries states "gills *yellow*, edges thickened and villose," and Stevenson "gills yellow, the edges thickened, obtuse and floccose." This summer, in the same station, I found the plant more abundant and specimens with all the gills white, edges entire; specimens with the gills yellow, the edges of the gills pectinate with little processes that reminded me of the cystidia which we sometimes note with the naked eye on the gills of Coprinus. Our photograph well shows them. These processes however, are *not* cystidia. Sometimes we notice specimens with only a few of the gills bearing these processes, the most of them being white and entire, and curious enough in these cases the *few* gills bearing these processes were *yellow*. There seems to be some connection between these processes and the yellow coloring matter. The color of the stem also varies much, some were mostly white as shown in Cooke's plate, some yellow, and rarely we met specimens with the stem purplish like the pileus. Since this plant is so variable, we do not question but that T. variegatum is a synonym.

125—FUNGI TRIDENTINI.

The recent fascicle (No. XIV) of Bresadola's splendid work is of particular interest to American mycologists in that there are referred to Europena species three plants heretofore supposed to be peculiarly American.

126—CLITOCYBE TABESCENS.

Bresadola has determined that the plant we considered and gave the American history under the name Clitocybe monadelpha, (see Myc. Notes No. 36), is identical with a plant described by Scoparius in 1772 under the name Agaricus tabescens and figured by Bulliard under the name Agaricus gymnopodius. As in the following plant Fries who knew the plant only from the illustration, erred as to the color of its spores and called it a Flammula, (Hym. Europe, p. 244). If Bresadola's views needed any confirmation, several years ago the editor of "Revue Mycologique" in reviewing Peck's illustration of the plant, claimed that it was the European species. We cannot but feel that "Mycological Notes" have added their mite in clearing up this matter. When we described Clitocybe monadelpha in 1899, Bresadola wrote us for specimens, stating that he thought he recognized in our description a plant of Europe. We are only sorry that our friend Father Langlois did not live to learn of this decision, for years ago he contended in his letters to us that the two plants were the same, a statement which we at the time opposed, for we did not suppose that it was possible for Fries so far to err.

127—LEPIOTA BADHAMI.

Our plant known here as Lepiota Americana is stated to be the same as the above species of Europe, which we suspected when we considered it (vide Myc. Notes, No. 8). It was first described and figured by Bulliard, Agaricus hæmatospermus (Pl. 595, f. 1), and Fries who knew it only from Bulliard's figure and dried specimens referred it to Psalliota (Syst. Myc. Vol. 1, p. 282 and Hym. Europ. p. 282). Fries however, was doubtful about its genus, for he states "I regret not having examined the spores. From the name they are blood red, though that seems dubious, in mass." After seeing Bresadola's figure, which is a far better illustration of our plant than any American colored figure yet produced, and knowing that Bresadola has examined dried specimens of our plant, there can be no question of the practical identity of the American and European plant. Still there is one discrepancy in the description that we should like to see reconciled. Bresadola describes the spores as "stramineae." We feel confident that our plant has spores pure white, and shall give special attention to it during the coming season. Bresadola calls the plant Lepiota hæmatosperma. We would prefer the name Lepiota Badhami, for personally we do not hold ourselves strictly bound by the "laws of priority," and do not believe in restoring an old name when that restoration perpetuates an error. Even if the plant has straw-colored spores, the name hæmatosperma is a misnomer. We consider that the plants themselves have

some rights in the matter of names, and that there is no justice in burdening a plant which has white or straw-colored spores with the name "blood-spored." Bulliard blundered in assuming that as the plant was red, its spores were red, or at least was careless in naming it, which is not ground enough for us to forever flaunt this blunder. As a matter of history it is interesting, as a matter of justice, both to the plant and to Bulliard let us forget it as soon as we can.

128—PHYLLOPORUS RHODOXANTHUS.

The good wishes of our friend Dr. Herbst, when we referred this plant to Flammula, that it was a good resting place and he hoped it would stay there, has not borne fruit, for already we find the plant under a new name. Bresadola has done an inestimable service in settling for once and all that the American and European plants are the same. Here again "Mycological Notes" have aided in the good work, for it was our description of the plant (see Myc. Notes, No. 37) that first drew Bresadola's attention to Schweinitz' species, and he wrote us for specimens of our plant. Bresadola refers it to a new genus Phylloporus established for it by Quelet and described as having gills, "venosely connected at the base or *often porose-anastomating,*" (italics ours).

Strictly speaking, this description does not fit our American plant, the gills of which are admirably described by Atkinson, "A few are forked toward the base, and the surface and the space between them are marked by anastomating veins forming a reticulum suggestive of the hymenium of the Polyporaceae. *The character is not evident without the use of a hand lens.*" (Italics ours). Still no one who has seen Bresadola's figure and knows the American plant, can question the essential identity of the two, notwithstanding the European plant is decidedly polypoid and the American plant only suggestively polypoid. We say no one, we mean no one who does not cast his species in iron moulds, and who recognizes plants as living beings capable of slight changes according to their environments. We are quite content to place this plant in a new genus, although it is going to embarrass future writers to fit the American plant to the generic characters. Our plant never was a very good Flammula, and a no better Paxillus.

129—PROF. ATKINSON'S BOOK.

We hail with delight the appearance of this book, because we believe it is the beginning of a new era in the study of American Fungi. When our writers begin to appreciate the fact that it is their duty to their co-workers to so describe and illustrate the plants they consider that others meeting them can feel a certainty of the determination, then we are getting on safe ground and real progress will be made. Prof. Atkinson's work is not exhaustive. He has wisely confined himself to plants he has met, and studied as they grew, and refrained from entering that shadowy world of recorded traditions concerning American agarics largely based on mummified remains. The illustrations of the book are superb, mostly photo reproductions, and

it is evident that it is beginning to dawn on Agaric students that a good photograph is the best illustration that can be made of a fungus, notwithstanding its "lack of color." If some of our European friends will take the hint and issue good photo reproductions of their plants, it would be a veritable boon to American mycologists who are working with a mycological flora, essentially the same, and are struggling to reconcile our plants with the crude, exaggerated and often conflicting plates purporting to represent European species.

Prof. Atkinson has been very modest in the publication of new species and has gotten some nice things, such as Hypholoma rugocephalum and Paxillus corrugatus, both of which we have known and of which we have had photographs for several years.

His Lepiota asperula is what we would call acutesquamosa, and we think his note on the latter species applies to something else. His Mycena cyanothrix is to our mind Peck's subcaerulea, not as stated by Prof. Webster in his review of the book, cyaneobasis; (the latter plant we think is Bresadola's calorhiza).

We do not offer the above as criticism of the book, for it cannot be expected that in our present uncertainty regarding American agarics, workers will agree on all the species. We rather offer it as evidence of highest praise for the work, that Prof. Atkinson has so plainly described and illustrated his plants, that we recognize those with which we are familiar at once. If we had any adverse criticism to offer, it would be in regard to the title "Mushrooms, edible, poisonous, etc." The book is too valuable from a systematic and scientific view to have the inference in the title that it was issued solely for the "mushroom eaters."

130—SAVE YOUR "PUFF BALLS."

No one can render me a greater service than by collecting and sending me such puff-balls as may come under their observation. As this article will reach many who perhaps have never given the subject of puff-balls much thought, a few suggestions may not be amiss. Every country boy is familiar with the puff-balls that grow about the fields. Boys are observing creatures, and I remember it was my especial delight when I was a boy to kick the "Devil's Snuff Boxes" in order to see the "smoke" fly. You may be surprised to learn that there are dozens of different kinds of puff-balls, each characteristic and possessed of peculiar shapes, or markings on the surface, or color of the "smoke" and that they can be readily studied and classified, and have names. The "smoke" (or spores) is a fine dust, analogous to the seed in other plants, and each particle of the dust is capable under proper conditions of germinating and producing puff-balls. Under the microscope each variety has its own sort of spores, some are smooth, some rough, some round, some oval, some have long tails, etc., etc. We present herewith photographs of some of the various kinds of puff-balls.

First, there are the Lycoperdons, (Fig. 26) and if you notice it closely you will note that it is covered with little soft spines stellately arranged. These spines differ much in various kinds and are important in classification. We have more varieties of Lycoperdon than any other family of puff-balls, Most of them are about the size of the kind figured, but some are no larger than hazel nuts. While some are shaped as shown, most are almost globose, and some are shaped like a pear. When fully ripe Lycoperdons open with a little mouth from which the spores escape. Then there are the Sclerodermas, (Fig. 27) thick skinned puff-balls which grow sometimes in the greatest abundance. The kind we have figured is particularly fond of chestnut woods. Then the Geasters, which have the shell in two layers, and when ripe the outer splits up into segments and turns back like a star. They are often called "Earth Stars." We are particularly anxious to get Geasters. Besides these three families are Bovistas, Bovistellas, Arachnions, Tylostomas, and others. Tylostomas are little puff-balls that grow up on stems.

Fig. 26.
Lycoperdon.

WHEN TO GATHER PUFF-BALLS.

For the purpose of study puff-balls must be ripe, that is they must be full of the dry dust. When young most kinds are white and when you cut them they appear like "cottage cheese." They are mostly good to eat in this condition, but not to study. The best time to gather them is just when they are getting ripe, just when the white has become moist, and discolored and spines are just drying up and beginning to flake off. Then your specimens will if carefully dried retain enough of the spines to be easily determined and the spores will ripen as the specimen dries. But do not hesitate to pick up ripe puff-balls even if the spines have fallen off. They are all of value *if ripe*.

Fig. 27.
Scleroderma.

HOW TO GATHER PUFF-BALLS.

Simply pick them up, handle them carefully so as not to mash them, and if they are just ripening and are moist, spread them out on the floor in a garret or where they will be out of the way and let them dry. Then pack them loosely in a little box, don't squeeze or bruise them, and express or mail to me. If you recognize different kinds, keep them separate. If your boxes are not full, pack in loosely, a little cotton or tissue paper (cotton is better) to fill out. Do not wrap in paper or put in paper bags. If you have enough to justify send by express at my cost, if only a small box by mail, and I will refund postage.

Fig. 28.
Geaster.

DO NOT SEND LARGE ONES.

The puff-balls we are anxious to get are the *little fellows* about the size of walnuts or apples and especially the very small ones like hazel nuts. There are a great many different kinds of small ones. There are only a few kinds of the big ones, say three inches or more in diameter, and it is not worth while to send them. If you are sending a lot of little ones by express, it would be well however, to enclose a single ripe specimen of any large kind you may find. If you have a very large one, say the size of your head or bigger, do not send it. It is Lycoperdon giganteum, and of no interest.

CONCLUSION.

Our museum bottles hold a pint and when a crop is found it is usually just as easy to gather enough to fill a bottle as to pick up one or two specimens, and it is far more satisfactory to me to have ample material to work with. Do not hesitate to send specimens because you fear they are something common. We will take the risk. Some years ago a friend in Philadelphia sent me a box of Geasters half apologizing for sending because they would probably prove to be something common. They are to-day the most interesting Geasters in my collection because no one else has ever sent them nor can I find them described. If you know the species, we will state that Lycoperdon gemmatum, Lycoperdon pyriforme, Scleroderma verrucosum, Geaster hygrometricus and all the large Calvatias are not specially desired. If you do not know them take the risk of their not being "something common" and pick up any little puff-ball you may meet. Your trouble will be fully appreciated.

131—NOTES ON SOME COMMON PLANTS.

The following notes are based on determinations made by Bresadola and Patouillard. They illustrate the necessity of studying our plants principally in relations to the plants of Europe.

132—FAVOLUS EUROPÆUS.

A dozen or more species of Favolus are credited to this country most of them being described from dried specimens sent to Berkeley and Montagne. There are many specimens in our collection from various collectors but with the exception of one from Louisiana they are all referable to the above species. It is certainly the only common species with us. When the plant first develops it is covered with a bright reddish tawny cuticle which peels off or fades out as the plant becomes old. Late in the season we often pick up specimens that are almost white. We venture the assertion that most of our "species" named by Berkeley and Montagne are founded on different stages of this same plant. Others we have reasons to believe are on various forms of our common Polyporus arcularius. In our literature the plant is usually called Favolus Canadensis but it is now well established that it does not differ from the European species.

133—PLEUROTUS NIDULANS.

This plant for many years was called in this country Panus dorsalis, a reference originally made we believe by Berkeley. That our plant is the same as nidulans of Fries is confirmed by Bresadola, and is so accepted in the recent writings of Peck. Although Schweinitz knew it, the identity had been lost and credit is due to Morgan for the clew that led to the facts. I think however after carefully studying Bosc' figure and description that he really had an unusual form of it, for most of his description applies to the plant and the most striking difference is the short stem in his illustration.

The usual form of the plant is broadly sessile; we have a photograph of a plant tending towards spathulate; and Peck states "rarely narrowed behind into a short stem-like base."

There is room for a difference of opinion as to the genus to which to refer this plant. The spores are pink and Peck places it in Claudopus. It unquestionably belongs there from Fries' definition of the Hyporhodii "spores roseae vel rubiginosæ." Atkinson describes the spores of Hyporhodii "rose color, pink, flesh or salmon color." All the species we have noted, Pluteus and Volvaria, have spores remarkably uniform in color, deep salmon. To our mind the color of the spores of this species is much closer to those of the white spored series through such connecting species as sapidus and subpalmatus than to the salmon color we associate with the Hyporhodii. We would therefore call it a Pleurotus.

The flesh is firm and tenacious and from this consideration the plant is not far out of place in Panus, indeed it is as tough as some common plants generally referred to Lentinus. The borderland between Panus and Pleurotus, as between Marasmius and Collybia, is

not sharply defined and as long as we maintain such genera as Panus and Marasmius founded on texture of flesh, so long will we have a number of doubtful reference.

Pleurotus nidulans is quite foetid when fresh, a fact that does not seem to be recorded.

134—PANUS RUDIS.

This is a very common plant in our woods and also grows in Europe. We have specimens from Mexico and Central America and have seen it growing in Samoa. It has in the past almost exclusively been called Lentinus Lecomtei by American mycologists though a little investigation, or thought, would have shown that it was not probably this plant of Schweinitz. L. Lecomtei has serrate gills, (see Fr. Elen. p. 47); Panus rudis has entire gills.

L. Lecomtei was described by Schweinitz from a specimen sent him from Georgia by Lecomte (see Syn. Car. p. 63). It is self evident that Schweinitz must have frequently collected the common Panus rudis.

In our opinion it is the Lentinus strigosus of Schweinitz, (the genus Panus was not established at that time). Fischer in Engler & Prantl has merged the genus Panus into Lentinus from which genus it was originally taken by Fries. Our observations tend to support this for we have in our Southern States a species "Lentinus" velutinus (teste Bresadola) with entire gills and a very similar plant L. Berterii with finely denticulated gills. These two plants are so much alike that they would probably be mistaken for each other except by a close observer and yet on a strict adherence to Fries' definition they must be placed in different genera.

Panus rudis is such an abundant species that it is worth inquiring into as regards its edible qualities. Its substance is tough and it will not prove a favorite for food. However, to flavor gravies and for similar purposes we predict that it will some day come into extensive use. H. I. Miller once wrote me "When skillet-broiled, the gravy is as good as nuts and raisins."

135—FOMES LEUCOPHÆUS.

An almost universal error has been made in the naming of our most common Fomes which is called Fomes applanatus. This species which grows on every log in our country is very rare in Europe and was unknown to Fries. Fomes applanatus which is the common plant in Europe is strangely infrequent with us and was generally confused with leucophæus until Morgan noted the distinction and called it reniformis. In general appearance the plants are very much alike but applanatus has softer tissue and there is a marked difference in the spores. Applanatus has echinulate spores, our common species leucophæus, smooth spores. The specimen of leucophæus in Schweinitz' herbarium is labeled "fomentarius." It is not strange that he records fomentarius "most common on frondose trees." My specimens of fomentarius are all from the north and east. I believe it does not occur about Cincinnati.

136—EXPLANATION OF A CUT.

Concerning the cuts in the recent work by Ellen H. Dallas and Caroline A. Burgin, entitled "Among the Mushrooms," one illustration perhaps needs explanation. When Mrs. Dallas applied to me for photographs to illustrate the book and requested the photograph of an amanita breaking from the volva, the best species to have illustrated this would have been Amanita phalloides or Amanita caesarea. Unfortunately, both of these plants occur but rarely in the vicinity of this city and I had no photograph that I could furnish of either of them. I happened to have however, a photograph of Amanita vaginata as it breaks from the volva, but it needs an explanation Amanita vaginata is a very common species everywhere The volva however, is usually deeply buried in the ground and you may collect the plant year after year abundantly and never see it break from the volva as shown in the illustration It is unusual to find it in the condition that I have photographed it and for this reason perhaps the photograph should not have been given as an illustration of "an amanita breaking from its volva."

137—A PUZZLING LITTLE PLANT.

NYCTALIS ASTEROPHORA.

Several seasons ago while collecting at Trexlertown, Pa. with my friend Dr. Herbst, we found growing on dead Russulas the little plant figured herewith. It was a clavate body bearing a dense coat of stellate spores on its upper surface. When very young these spores were covered with a thin membrane, which as the spores ripened, broke into fragments and peeled off. Many long discussions had Dr. Herbst and I regarding the nature of this plant, Dr. Herbst thought it was Nyctalis asterophora and that the spores were those of some parasitic Hypomyces that deformed the plant similar to the way the common Hypomyces Lactifluorum deforms species of Lactarius. Our knowledge of Nyctalis asterophora at that time was confined to Cooke's figure (a developed gill-bearing specimen to which our deformed plants had not the slightest resemblance) and Fries' statement "the powder covering the pileus under the microscope consists of stellate, hexagonal spores. Is it not a parasitic mucor?"

Fig. 29.
Nyctalis asterophora.
(Natural size.)

I contended that it could not be that plant for the "powder" was not parasitic else the plant would not develop a special membrane to protect it when young. I believed that the spores belonged to the plant and that is was something akin to a gastromycetes.

Since those days we have learned a great deal more about the plant and it has puzzled the European mycologists as much as it did us. Specimens sent to Ellis, Patouillard and Bresadola, have fully confirmed Dr. Herbst' opinion that the plant is Nyctalis asterophora. The

plant such as we found it was described and illustrated by most of the very earliest botanists Micheli, Schaeffer, Bulliard, Dittman, and called Agaricus Lycoperdoides, Elvella clavus, Asterophora Lycoperdoides. It was not known in those days that it was a deformed state of a gill bearing plant and Fries first accepted that view in Epic. Syst. (1836-8). The plant rarely develops gills, such as shown in Cooke's figure, and the ordinary basidiospores of Agarics. That this state must be rare we judge from the statement in the recent Engler & Prantl where these basidiospores are stated to be "smooth and brown" on the authority of Karsten. The common form is the little abortive plants we have figured bearing a dense coat of stellate spores on the top of the pileus. The nature of these spores was long a disputed question in Europe. Corda, Bonorden and Tulasne contended that they were the spores of a separate parasite, a species of Hypomyces, which grew on the pileus of this parasitic Agaric, and Fries from the quotation we have given was evidently inclined to this view. De Bary has established however and it is now generally accepted in Europe that they are a secondary form of spores of the Agaric called by De Bary chlamydospores. De Bary's position was maintained by demonstration that the hyphae bearing these spores were continuous with the hyphae of the plant. We are surprised that De Bary did not advance the argument that the plant would not develop a special membrane to protect them when young if they were *parasitic*. Indeed, this seems to have been overlooked by all those engaged in the discussion in Europe. It will probably be news to most of our readers that an agaric should, in addition to the usual spores on the gills, bear an entirely different kind of spores on the *top of the pileus*. Has any one ever seen Nyctalis asterophora in this country with the gills developed?

138—GYROPHRAGMIUM (?) DECIPIENS.

We have received through the kindness of Louis A. Greata, a specimen of the plant called by Prof. Peck, Secotium decipiens. As the genera of these curious plants are now known this species is a Gyrophragmium or Polyplocium for the plates are arranged in a somewhat lamellate manner, indeed the plant comes very near being an agaric. Some time ago Berkeley described a "Scleroderma" from Texas, Scleroderma Texense, which Massee since placed in the genus Gyrophragmium. If the Texas species is a Gyrophragmium there is a probability of it being the same as the Californian but we will have to know more about both before it can be decided.

We have always claimed that hunting up of old names to replace familiar names in use belongs to the antiquarian not the botanist, and now Worthington G. Smith refers some of the "illustrations of fungi" more properly to the "Stone Age."

"Some published plates of fungi, both old and new, are extremely bad both in drawing and color; some mycological "artists" do not seem to have possessed the most elementary knowledge of drawing, and the illustrations compare unfavorably even with the art works of palaeolithic men."—*Worthington G. Smith, in Journal of Botany.*

139—AMENDE HONORABLE.

In our pamphlet "Volvae" we questioned the accuracy and value of the Agaric list in "Harkness and Moore's Catalogue of the Pacific Coast Fungi" and ascribed the list to H. W. Harkness. Mr. Harkness however, in a conversation with us since, disclaimed all responsibility for the Agaric portion of this list, stating that this part was furnished by J. P. Moore, and he thought it was so stated in the preface. We are unable to find reference to this matter in the preface but are glad to relieve Mr. Harkness of the responsibility. We have not however, changed our views concerning the value (?) of this list (the Agaric portion), nor of the list of Minnesota by Johnson, nor of that of Wisconsin by Bundy. It is not a question of ability but rather lack of experience and of library facilities which has prevented them from correctly determining all the Agarics they have met.

140—NOMENCLATURE.

Our friend, Walter Deane, in a private letter expresses the opinion that the system we have adopted of omitting the author's name from the name of plants will cause confusion in cases where the same name has been applied to different plants by different authors. We think not. If we knew that such was the case at the time of considering the plant we would try to clear up the matter in the text, if we did not know it (and it should be our place to know it if we write on the plant) we would hope to so plainly describe and illustrate the plant under consideration that others could have no trouble in identifying the very plant we have in view. While there is of course, some ground for ambiguity, the facts are that the usual mistakes are errors of determination; errors in describing a plant as new which is not new (the most fruitful source of all synonyms); error in identifying a plant as a species when it is not that species. If we find a plant that we think belongs to Fomes applanatus which in fact does not, how can it help matters to write Persoon's name after it? Mycologists in this country have been listing and describing "Fomes applanatus Pers." or "Polyporus applanatus Pers." and yet not one of them has had Fomes applanatus. What does writing the name "Persoon" have to do with such errors and they are the common mistakes that we all make. Instead of being a matter of "justice" to Persoon it is a rank injustice for it ascribes a plant to him with which he had nothing to do. The facts are that the binomial system of Linnaeus which is even yet so highly lauded, has gone out of use. Botanists are using a trinomial (even a quadrinomial in some cases) and in our opinion not only to no improvement but the greatest hindrance to systematic botany as the direct incentive to nine out of ten of our synonyms.

Nobody accuses Fries of ambiguity and yet Fries did not find it necessary in his last and greatest work to write authors' names after plants. He gave book references and synonyms and in our opinion there only do authors' names belong.

141—URNULA CRATERIUM IN EUROPE.

This species so common with us in the spring is very rare in Europe. It was found in Hungary some thirty-five years ago and called by Schulzer von Muggenberg, Peziza adusta. It has since been called Craterium microcrater by Haslinski and transferred to Urnula microcrater by Saccardo. Its recent discovery in France (1898) was thought to be of enough importance, so that Boudier illustrates and describes it (Bull. Soc. Myc. France), and established the synonymy we have cited. In view of the fact that the plant is so common with us, its rarity in Europe is of special interest.

142—SPORE PRINTS.

We have received some beautiful spore prints from Geo. E. Morris, No. 34 Applegate St., Waltham, Mass. and Mr. Morris has favored us with his method of preparing them as follows:—

"Good spore prints are due mostly to careful attention to simple details.

Be sure to select for spore prints, mushrooms that have no upturned edges, etc. but with edges of gills on the same plane, i. e. flat.

Cut off stem carefully as near to gills as possible and have the gills just clear the paper when placed for printing

For dark spores any rather rough or unsized white paper will answer.

The time necessary for enough spores to fall to make a clear print varies so much that experience will be the best guide. I have made prints from Coprinus atramentarius in ten minutes while some others have taken 48 hours

To prevent rubbing off spray prints lightly several times, at intervals, using the common artist's fixative and atomizer, diluting fixative with equal bulk of alcohol. (Fixative may be made with white shellac and alcohol.)

Cover mushrooms while printing with tumbler, etc. or bell jar, if at hand.

The importance of spore prints has not been appreciated in some quarters I am sure, as in addition to color and size of spores, the prints give unmistakable facts as to spacing of gills."

I wrote Mr. Morris that in my opinion any process of preserving spores involving a use of a liquid would somewhat change the color. He replies:—

"Very little change takes places in color in fixing spore prints. Sometimes spores are disarranged by being floated out of place, and some white spored species are entirely lost by being "absorbed" but in the main fixing has very little damaging effect."

My method of preserving prints is to simply deposit them on white paper (I do not preserve white spores as I see no object in it) and paste the paper on the bottom of a shallow box to prevent rubbing. It has one very serious objection. A little "bug" which lives on spores is apt to be thrown down with the spores and eat the deposit entirely up. This only happens however, in comparatively a few of the deposits.

MYCOLOGICAL NOTES.

BY G. G. LLOYD.

No. 7.

CINCINNATI, O. SEPTEMBER, 1901.

143—ACKNOWLEDGMENT OF "PUFF BALLS" RECEIVED.

We have had a very liberal response to our circular sent out in June, requesting specimens of "Puff Ball." Our thanks are extended to the following for specimens received:

L. A. GREATA, LOS ANGELES, CAL.,

Geaster hygrometricus, var. giganteus, (Note 1), Gyrophragmium Delilei (Note 2), Bovista plumbea, Lycoperdon gemmatum, Lycoperdon elegans (?).

PROF. T. H. MACBRIDE, IOWA.

Lycoperdon pusillum, Lycoperdon gemmatum, Lycoperdon asterospermum, Lycoperdon pyriforme, Lycoperdon molle, Catastoma circumscissum, Myriostoma coliformis (from Dakota), Bovista plumbea, Geaster saccatus (Note 17), Geaster striatulus (Note 8), Bovista pila, Tulostoma (Note 16), Geaster minimus, Geaster hygrometricus var. giganteus (see Note 1), Bovista lateritia, (from Mexico), Scleroderma verrucosum (Note 13), Mycenastrum spinulosum (Note 19) Geaster limbatus.

ELLA K. HAYES, LAKEWOOD, N. Y.

Geaster hygrometricus.

CAROLINE A. BURGIN, PHILADELPHIA, PA.,

Lycoperdon gemmatum (form).

MINNESOTA BOTANICAL SURVEY.

Secotium acuminatum, Catastoma subterraneum, Bovista plumbea, Geaster triplex, Mycenastrum spinulosum, (Note 19), Geaster mammosus, Geaster saccatus, Geaster hygrometricus, Tulostoma (Note 16), Calvatia tabacinum, Geaster fimbriatus.

DR. WM. HERBST, TREXLERTOWN, PA.,

Mitremyces cinnabarinus (Note 4), Geaster triplex, Geaster mammosus, Scleroderma verrucosum, (Note 13), Scleroderma vulgare, Bovista pila, Calvatia craniiformis, Geaster saccatus (Note 17), twenty-eight collections of Lycoperdons (Note 5).

PROF. BEARDSLEE.

Mitremyces cinnabarinus, from West Virginia, (Note 4), Geaster Bryantii, from Cleveland, O. Bovista plumbea, Lycoperdon separans, Calvatia elata and five Lycoperdons (Note 5.)

STEVE C. STUNTZ, MADISON, WIS.

Geaster limbatus (Note 10), Scleroderma vulgare, Scleroderma vulgare var. verrucosum, (Note 12), Scleroderma verrucosum (Note 13), Lycoperdon gemmatum.

REV. G. BRESADOLA, TIROL.

Geaster Schmidelii, Geaster rufescens, Geaster fornicatus, Geaster minimus (Note 4), Geaster fimbriatus, Geaster tunicatus, Geaster hygrometricus, Geaster pectinatus, Geaster limbatus, Tulostoma squamosum, Tulostoma Barlæ, Bovista tomentosa, Tulostoma mammosum.

CARLETON REA, ENGLAND.

Geaster fimbriatus, Geaster rufescens, Geaster limbatus, Geaster (Sp. undetermined.)

L. ROWELL, SWEDEN.

Geaster Kunzei, Geaster rufescens, Geaster fornicatus, (Note 9), Geaster tenuipes (Note 10.)

E. BOUDIER, FRANCE.

Geaster minimus, Polysaccum pisocarpium (Note 14), Rhizopogon rubescens. Geaster rufescens, Tulostoma squamosum, Geaster pectinatus, Geaster fimbriatus, Octaviania asterosperma, Cyathus campanulatus, Tulostoma mammosum, Tulostoma granulatum, Hydnangium monosporum, Rhizopogon provincialis, Lycoperdon echinatum, Scleroderma vulgare var. verrucosum.

P. H. ROLFS, CLEMSON COLLEGE, S. C.

Calvatia cyathiformis, Lycoperdon separans, Lycoperdon piriforme, Geaster hygrometricus, Scleroderma flavidum, Polysaccum pisocarpium, Geaster minimus, Scleroderma bovista (?), Bovistella Ohiensis, Scleroderma Geaster, Lycoperdon several species (Note 5.)

P. L. RICKER, ORONO, MAINE.

Bovista pila, Lycoperdon several species (Note 5.)

B. O. LONGYEAR, MICHIGAN.

Geaster minimus, Catastoma subterraneum, Tulostoma (Note 16), Five Lycoperdons (Note 5), Catastoma circumscissum, Lycoperdon pusillum, Lycoperdon citrinum (very ?).

E. M. WILCOX, STILLWATER, OKLAHOMA.

Calvatia caelata.

MRS. PATTERSON, WASHINGTON, D. C.

Geaster radicans (From Florida) (Note 15.)

MRS. SAMS, FLORIDA.

Scleroderma vulgare, Scleroderma verrucosum (Note 13), Catastoma Polysaccum crassipes, Geaster hygrometricus.

MRS. E. B. BLACKFORD, BOSTON, MASS.

Arachnion album, Scleroderma verrucosum, Globaria (Sp.) Scleroderma vulgare var. verrucosum, Lycoperdon gemmatum.

MRS. GEO. M. DALLAS, PENNSYLVANIA.

Scleroderma (spec.) Lycoperdon gemmatum, Lycoperdon (two species) (Note 5.)

DR. L. HOLLOS, HUNGARY.

Geaster triplex, Geaster fenestratus (Note 6), Geaster rufescens, Myriostoma coliformis, Geaster fimbriatus, Geaster hygrometricus, Geaster Schmidelii, Geaster asper (Note 7), Geaster fornicatus, Mycenastrum Corium, Secotium acuminatum, Geaster limbatus, Geaster striatulus (Note 8), Geaster mammosus, Geaster delicatus, Catastoma subterraneum (Note 18.)

MARY S. WHETSTONE, MINNEAPOLIS, MINN.

Two Lycoperdons (Note 5.)

WM. C. BATES, BOSTON, MASS.

Calvatia lilacina.

PROF. GEO. F. ATKINSON, ITHACA, N. Y.

Scleroderma verrucosum (Note 13.)

JAMES BIRCH RORER, NEW HAVEN, CONN.

Lycoperdon separans, Scleroderma verrucosum, (Note 13), Geaster hygrometricus, Scleroderma (Sp.).

DR. H. L. TRUE, McCONNELLSVILLE, O.

Geaster rufescens.

FRED J. BRAENDLE, WASHINGTON, D. C.

Lycoperdon piriforme, Lycoperdon gemmatum, Bovistella Ohiensis, Scleroderma verrucosum, (Note 13), Arachnion album.

SIMON DAVIS, FALMOUTH, MASS.

Scleroderma vulgare var. verrucosum, Lycoperdon hiemale, Bovista plumbea, Calvatia lilacina.

N. PATOUILLARD, PARIS, FRANCE.

Gyrophragmium Delilei.

Specimens received since this was in type will be acknowledged in next issue.

144—NOTES ON GASTROMYCETES RECEIVED.

145–Note 1–GEASTER HYGROMETRICUS VAR. GIGANTEUS.

Fig. 30.

Geaster hygrometricus var. giganteus.
Specimen from L. A. Greata, California.

The specimens received from L. A. Greata and Prof. Macbride are so much larger than normal that we think they merit the name var. giganteus. The accompanying illustration is natural size. We think that this large form does not occur in Europe.

146—Note 2—GEASTER MINIMUS.

Most of our foreign specimens of this species were received under the name Geaster marginatus. Having studied the foreign plants and looked up Vittadini's illustration there is no doubt that it is the same little common plant we have, Geaster minimus, which name is firmly established in this country and has "priority."

147—Note 3—GYROPHRAGMIUM DELILEI.

This plant (see Myc. Notes, No. 136), according to Patouillard, who is familiar with the original plant from Northern Africa and Southern Europe, and than whom there is no better authority, is Gyrophragmium Delilei "tout á fait." It is the identical plant on which the genus was founded. The character of Gyrophragmium in the very recent Engler & Prantl

Fig. 31.

"Pore-like chambers" of Gyrophragmium.

Fig. 32.

Section of Gyrophragmium Delilei.
Specimen from L. A. Greata, California.

"gleba with radial disposed lamellæ" is misleading. The tramal plates are lamellate but they are strongly convolute and sinuate. When Berkeley met plants of the genus from South Africa, no doubt misled as to the nature of the plates of Gyrophragmium he founded on them a new genus, Polyplocium, which Fischer in Engler & Prantl characterizes as having "gleba with pore formed chambers." These "pore-like" chambers are formed by the sinuosities of the tramal plates as shown in our figures (31 and 32) and there is no structural difference between "Polyplocium inquinans" of South Africa and Gyrophragmium Delilei of Northern Africa. The principal difference is in the spores, the former having ovate, the latter globose spores. Indeed Berkeley's illustration of "Polyplocium inquinans" (copied in Engler & Prantl) is a fair representation of our Western plant. Montagne's figure, we think, is the one at fault.

We will not go into detail here regarding its history in American works. It has been called by almost every name but the right one. Originally sent years ago, from California, it was referred to the South African species Polyplocium inquinans. Harkness so records it and in addition describes a new species Polyplocium Californicum based we believe (having seen his specimens) on slender forms of the same plant. It was described from Texas as Scleroderma Texense, afterwards changed to Secotium Texense, and still later to Gyrophragmium Texense. In very recent years it was described as a "new species," Secotium decipiens. The plant is fairly frequent in the sand along the Pacific Coast and in the semi-arid regions of the South West. We have been abundantly supplied with specimens through the kindness of L. A. Greata to whom we extend our special thanks.

148—Note 4—MITREMYCES.

It will be noted that we do not follow the recent monographer of this genus who dug up an old doubtful name in an obscure French journal to displace a name concerning which there was no doubt, and which had become attached to the genus by eighty years constant use, by such authorities as Fries, Schweinitz, Corda, Berkeley. This substitution had not even the merit of being based on antiquarian research, for it had been known, recorded and *rejected* by such men as Fries. Nees von Esenbeck's name, Mitremyces "mitre-fungus" is the most appropriate name that can be applied to the plant because the "mitre-mouth" is a prominent and peculiar character of the plant; Calostoma "beautiful mouth" is quite indefinite. Nees illustrated the genus well and no question can be raised as to the identity of the plant he had in view. It required half a page of argument in the attempt to show that this was Desvaux' plant. The only result of such work is to make "new combinations" to which the monographer could add his name and we submit, the ends do not justify the means.

149—Note 5—LYCOPERDONS.

We are particularly anxious to get all the material we can regarding this genus, though at this writing we have not closely studied it. Hence many plants received are recorded simply as species.

Through the kindness of our European correspondents we have fairly complete sets of the plants of other Gastromycetes genera, but Lycoperdon being the largest and most difficult we have postponed its study to the last and refrained from asking our foreign friends for specimens. We expect to get sets of European plants in the near future and shall then take up the study of our American material. To attempt to work up the American material without having the European species for comparison we feel to be useless. Please do not fail to send us any Lycoperdons you may meet, as above all other Gastromycetes we are particularly anxious to get them.

150—Note 6—GEASTER FENESTRATUS.

Fig. 33.
Geaster fenestratus.
Specimen from Dr. L. Hollos, Hungary.

This plant was received under the name Geaster Marchicus, which although a comparatively recent name is undoubtedly the plant that Battara illustrated (1755) and Batsch illustrated and recorded (1783) under the name Lycoperdon fenestratum. As a matter of fact, it is probably the original of Geaster fornicatus being one of the figures that Hudson cites in his conglomerate citation of this species. We would give the name fornicatus however, to another species, (see Note 9) on account of it being universallv so applied by continental botanists of Europe. Geaster fenestratus is more typically fornicate and really merits the name fornicatus more than does the plant that bears it.

151—Note 7—GEASTER ASPER.

We received this plant from Hungary under the name Geaster pseudo-mammosus. It is strongly characterized by the verrucose inner peridium, a feature that is well shown in Michelius' old plate and is one of the original Geasters published. The peculiar verrucose inner peridium is also shown in Schmidel's plate, (t 82 Geaster coronatus &c.) It has been described a number of times as a new species, namely, Geaster Berkeleyi, Massee, Geaster Drummondi, Berkeley, Geaster campester Morgan

Fig. 34,
Geaster asper.
Specimen from A. P. Morgan, Ohio.

152—Note 8—GEASTER STRIATULUS.

This is the plant that was distributed (No. 109) in Ellis' exsiccatæs which we have examined in Philadelphia, Washington and New York under the name Geaster mammosus. On noting the specimens, I could not understand how Morgan could have referred this little plant with the rigid incurved peridium to Fries' Geaster umbilicatus, which is described as having a soft, flaccid peridium and I took the question up with him during a recent conversation.

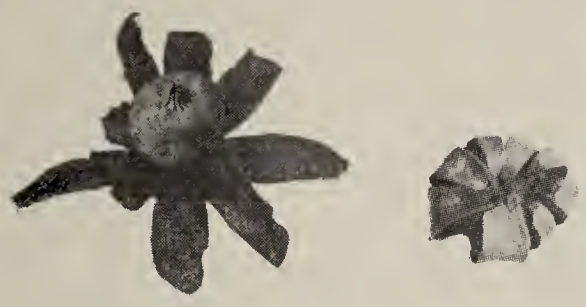

Fig. 35.

Geaster striatulus.
Specimen from Dr. Hollos, Hungary.

He hunted up the original specimens Ellis had sent him under this label and they are unquestionably correctly determined, Geaster umbilicatus, (and they are the only specimens we have ever seen of this plant), but they are not the plants that Ellis distributed under the name mammosus, in his exsiccatæ, at least in the three copies that I have examined.

153—Note 9—GEASTER FORNICATUS.

If there is any name that is well established by custom *it is of this plant.* To illustrate we have received it from France, Austria, Hungary and Sweden under the above name and we have seen a dozen or more exsiccatæ from Continental Europe, always the same typical little plant. Rowell tells me it is the most common Geaster in Sweden. We question very much if it is the original Geaster fornicatus, or indeed, that the original Geaster fornicatus of Hudson can now be established since the author gave such conflicting citations.

The name is so firmly established by use in Continental Europe that it is unwise to attempt to change it. The plant that Massee illustrates under this name, and of which we have received imperfect specimens from England, we have not been able to locate, but it is not, we think, the plant in question.

Fig. 36.

Geaster fornicatus.
Specimens from Rev. G. Bresadola, Tirol.

154—Note 10—GEASTER LIMBATUS.

While this is supposed to be one of the most common plants of this country, we are unable to reconcile our frequent plant with the specimens of Geaster limbatus received from Europe and we take our common plant to be Geaster rufescens (stipitate form.) We have received what we would call limbatus only from Mr. Stuntz, of Wisconsin and Professor Macbride, of Iowa.

155—Note 11—GEASTER TENUIPES.

Fig. 37.

Geaster tenuipes.
Specimen from L. Rowell, Sweden.

We named this plant on receipt Geaster calyculatus on the strength of the description in Rabenhorst's recent edition, and it is undoubtedly the Geaster calyculatus of that work, but we find it is not the plant Fuckel has illustrated in his cut. The plant is strongly characterized by the ridges on the base of the inner peridium as shown in our illustration. It is doubtful to our mind whether this is the plant of Schmidel (t 37 f 11, 12, 13 and 14) on which Persoon bases his Geaster pectinatus.

156—Note 12—SCLERODERMA VULGARE VAR. VERRUCOSUM.

The common plant that we have in chestnut woods (see Myc. Notes Fig. 27)of ten called in this country Scleroderma verrucosum is not the one of Europe. It appears to us to be a species distinct from the smooth form of Scleroderma vulgare, but intermediate forms are said to occur. Fries includes in vulgare all forms with thick, firm peridium. He states "after 20 years study of the numerous forms that occur in the fields of Femsjœ I have little doubt of the limitation of the species. Differences of color, size, *superficial markings* are of *no value*." Scleroderma vulgare and its varieties have a *thick, hard* peridium; Scleroderma verrucosum has a *thin* peridium and is liable to be taken for a Lycoperdon.

(*Notes continued in next issue.*)

MYCOLOGICAL NOTES.

BY G. G. LLOYD.

No. 8.

CINCINNATI, O. NOVEMBER 1901.

157—ACKNOWLEDGMENT OF "PUFF BALLS" RECEIVED.

The following specimens have been received since last acknowledgement, Our special thanks are extended to all who have kindly sent specimens.

E. J. ARRICK, McCONNELSVILLE, O.

Lycoperdon sp. Geaster rufescens.

HUGO BILGRAM, PHILADELPHIA, PA.

Geaster Ohiensis, Lycoperdon two species, Lycoperdon subincarnatum, Scleroderma vulgare var. verrucosum, Calvatia (?), Lycoperdon glabellum,

M. G. BOHN, MIAMISBURG, O.

Lycoperdon Curtisii.

F. J. BRAENDLE, WASHINGTON, D. C.

Mitremyces Ravenelii, Scleroderma verrucosum, Scleroderma vulgare, Lycoperdon glabellum, Lycoperdon pseudo-radicatum p. t., Calvatia lilacina (?), Calvatia craniiformis (?).

T. S. BRANDEGEE, SAN DIEGO, CAL.

Podaxon Farlowii.

C. A. BURGIN, WERNERSVILLE, PA.

Calvatia craniiformis, Calvatia cyathiformis, Lycoperdon gemmatum, Lycoperdon species, Lycoperdon coloratum, Lycoperdon separans, Geaster minimus, Geaster pectinatus, Calvatia craniiformis, Lycoperdon echinatum, Lycoperdon piriforme,

GEORGE L. CLARK, NEWTONVILLE, MASS.

Lycoperdon gemmatum.

S. S. CROSBY, CAMBRIDGE, MASS.

Lycoperdon, two species.

ELLEN M. DALLAS, PHILADELPHIA PA.

Geaster hygrometricus, Geaster saccatus, Lycoperdon gemmatum, Lycoperdon seven species.

SIMON DAVIS, FALMOUTH, MASS.

Scleroderma vulgare var. verrucosum, Lycoperdon separans, Phallus Ravenelii, Lycoperdon four species, Lycoperdon coloratum, Lycoperdon Curtisii, Scleroderma verrucosum (typical), Lycoperdon Wrightii (?), Geaster hygrometricus, Lycoperdon Turneri (?), Lycoperdon Curtisii.

E. P. ELY, MONTICELLO, MINN.

Lycoperdon two species, Bovista pila, Bovista plumbea var. ovalispora, Secotium acuminatum, Lycoperdon gemmatum, Lycoperdon coloratum.

M. L. FERNALD, CAMBRIDGE, MASS.

Lycoperdon gemmatum, Lycoperdon piriforme.

GEO. B. FESSENDEN, BOSTON, MASS.

Arachnion album, Lycoperdon piriforme, Lycoperdon Curtisii.

T. GARDNER, PENN.

Scleroderma vulgare var. verrucosum, Lycoperdon gemmatum, Calvatia cyathiformis.

N. M. GLATFELTER, ST. LOUIS, MO.

Lycoperdon piriforme (?), Bovistella Ohiensis, Lycoperdon gemmatum, Scleroderma vulgare, Calvatia rubroflava, Lycoperdon separans, Geaster saccatus, Scleroderma verrucosum, Calvatia fragilis, Calvatia craniiformis.

L. A. GREATA, LOS ANGELES, CAL.

Tulostoma campestre, Gastromycetes undetermined (a new genus ?.)

WM. HERBST, TREXLERTOWN, PA.

Scleroderma vulgare, var. verrucosum.

T. H. MACBRIDE, IOWA.

Secotium acuminatum.

A. J. McCLATCHIE, PHOENIX, ARIZ.

Podaxon Farlowii.

P. MAGNUS, BERLIN, GERMANY.

Lycoperdon hiemale, Lycoperdon piriforme, Lycoperdon turbinatum, Geaster lageniformis, Bovista plumbea.

ED R. MEMMINGER, FLAT ROCK, N. C.

Lycoperdon gemmatum, Mitremyces cinnabarinus, Scleroderma (sp.)

C. E. MONTGOMERY, PORTSMOUTH, N. H.

Scleroderma vulgare var. verrucosum, Lycoperdon (3 species), Lycoperdon coloratum, Bovista plumbea, Lycoperdon gemmatum, Lycoperdon muscorum, Scleroderma vulgare, Geaster Schmidelii.

C. H. MORRIS, McCONNELSVILLE, O.

Calvatia craniiformis, Calvatia cyathiformis.

GEO. E. MORRIS, WALTHAM, MASS.

Mitremyces cinnabarinus, Scleroderma verrucosum, Scleroderma vulgare var. verrucosum, Lycoperdon (two species.)

L. H. PAMMEL, AMES, IA.

Calvatia craniiformis, Secotium acuminatum, Calvatia cyathiformis, Lycoperdon Curtisii, Calvatia craniiformis.

S. B. PARISH, SAN BERNARDINO, CAL.

Gyrophragmium Delilei.

FLORA W. PATTERSON, WASHINGTON.

Lycoperdon calvescens (?).

MRS. F. A. PIERCE, BROOKLINE, MASS.

Lycoperdon gemmatum, Lycoperdon piriforme, Lycoperdon hirtum, Lycoperdon Wrightii (?).

QUINCY POND, BOSTON, MASS.

Scleroderma verrucosum.

P. H. ROLFS, MIAMI, FLA.

Scleroderma verrucosum, Geaster hygrometricus.

JAMES BIRCH RORER, NEW HAVEN, CONN.

Bovista pila, Scleroderma (sp. undetermined).

MRS. SAMS, NEW SMYRNA, FLA.

Polysaccum crassipes, Myristoma coliformis, Geaster Bryantii (?) Scleroderma verrucosum, Geaster umbilicatus, Geaster lageniformis, Geaster saccatus, Scleroderma vulgare, Scleroderma Geaster.

F. L. SARGENT, CAMBRIDGE, MASS.

Lycoperdon two species, Lycoperdon gemmatum, Scleroderma verrucosum, Scleroderma vulgare var. verrucosum, Geaster limbatus, tasiBvo pila.

A. D. SELBY, WOOSTER, O.

Geaster saccatus, Lycoperdon piriforme, Lycoperdon molle, Lycoperdon gemmatum.

J. GILBERT SELBY, EGLON, W. Va.

Lycoperdon molle, Lycoperdon gemmatum.

C. L. SHEARS, WASHINGTON, D. C.

Scleroderma vulgare, var. verrucosum, Geaster triplex, Scleroderma verrucosum, Geaster hygrometricus.

WM. STUART, LAFAYETTE, IND.

Lycoperdon Curtisii.

W. N. SUKSDORF, BINGEN, WASHINGTON.

Geaster hygrometricus, Geaster delicatus, Bovista plumbea, Scleroderma Geaster, Geaster hygrometricus var. giganteus, Bovista pila, Calvatia bovista, (?), Lycoperdon (sp.), Bovista plumbea, Lycoperdon gemmatum, Hysterangium (?), Lycoperdon pussilum, Geaster lageniformis.

DR. H. L. TRUE, McCONNELSVILLE, O.

Lycoperdon coloratum (?), Lycoperdon separans, Secotium acuminatum.

L. R. WALDRON, MICH.

Geaster triplex, Lycoperdon gemmatum, Calvatia cyathiformis, Lycoperdon separans, Secotium acuminatum, Phallus duplicatus, Calvatia favosa.

MARY S. WHETSTONE, MINNEAPOLIS, MINN.

Secotium acuminatum, Tulostoma campestre, Scleroderma vulgare.

MRS. EUGENE WRIGHT, HUBBARD LAKE, MICH.

Calvatia craniiformis, Bovista pila.

E. P., ELY, BROOKLYN, N. Y.

Geaster triplex, Geaster lageniformis.

C. H. BURGIN, PENN.

Geaster pectinatus, Geaster triplex, Geaster minimus.

C. L. SHEARS, TAKOMA PARK, MD.

Mitremyces Ravenelii.

H. H. HUME, LAKE CITY, FLA.

Calvatia, (sterile base.)

158—Note 13—SCLERODERMA VERRUCOSUM.

Fig 38.
Scleroderma verrucosum.

It seems a kind of paradox to call the little smooth species "verrucosum" and this is one of the cases where a plant should be renamed and the old name forgotten. It is a very frequent species in our country, widely distributed and fairly constant as to form and size. Both Bresadola and Patouillard have determined our plant as verrucosum and we have just received specimens of the same plant from Europe so labeled from Patouillard. We cannot go behind such authorities. Though we have never seen Bulliard's plate we can depend upon it that Patouillard has it right. But we cannot understand how Fries can cite "Grev. t. 48 bona" for that to our mind is evidently not this plant but the one we have illustrated Fig. 43. Prof. Ellis always determined it S. Bovista and if I am not mistaken he told me that was Cooke's determination. Prof. Trelease seems to have been the only American author that has it right. It is probably S. lycoperdoides of Schweinitz but the specimen is missing from his collection.

159—Note 14—GEASTER RADICANS.

Our thanks are especially due to Mrs. Patterson of the division of Vegetable Pathology, of Washington, for a specimen of this beautiful plant, which was collected on a cedar log in Florida, (the collector's name not preserved.) It is really the most typically fornicate species we have in this country, but it is not Geaster fornicatus of Europe (as labeled), nor indeed is there any record of its occurrence in Europe. This plant was distributed by Ravenel, No. 103 and is we think the same plant that is preserved in Schweinitz' herbarium under the name Geaster quadrifidum (supposed in Europe to be a synonym for fornicatus.) All its stations are Southern and we believe it does not occur in our Northern States.

Fig. 39.
Geaster radicans.
Specimen from Mrs. Flora Patterson.

160—Note 15—POLYSACCUM.

We do not adopt a recently substituted name Pisolithus for this genus for reasons similar to those offered for not adopting Calostoma (see Note 3.)

161—Note 16—TULOSTOMA.

Up to the present time we have been unable to get a clear idea of our native species of Tulostoma. We thought we had our specimens straightened out but the European determinations have completely upset our views. We are still working on the matter and in the meantime are anxious to procure all the material we can relating to the genus. We have in this country a great many more Tulostomas than is generally supposed. Miss Violetta White, of New York, has recently published a paper on the genus, in which she describes seventeen species, only two of which occur in Europe. If this is the case Tulostoma is an exception to all other American genera.

162—Note 17—GEASTER SACCATUS.

We think there are two distinct plants indiscriminately known in this country (and both have been so determined at first for me in Europe) as Geaster saccatus. We have been very much puzzled over the matter, but feel that it is now straightened out thanks to advice from Bresadola. Geaster saccatus is the little plant that grows so common over leaf mold in the woods. It is globose in its unexpanded form. The other plant that has been known in our county as G. saccatus is Geaster lageniformis (see No. 167, Fig. 44)

Fig. 40.
Geaster saccatus.

163—Note 18—CATASTOMA CIRCUMSCISSUM.

Our thanks are due to B. O. Longyear, of Michigan, for calling attention to a spongy layer shown in our illustration, which lies between the outer and the inner peridiums. This layer had been entirely overlooked by us and apparently by all who have written on the plant but it is quite distinct not only on all the plants Mr. Longyear sends but in all the collections in our museum. We think it is an overlooked character.

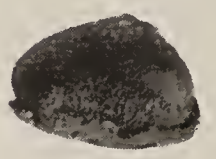

Fig. 41.
Catostoma circumscissum.

164—Note 19—CATASTOMA SUBTERRANEUM.

This specimen we received from Hungary under the name Bovista debreceniensis but it is identical with the plant that we have in this country under the name Catastoma subterraneum. We do not know which name has priority not having taken the trouble to look the matter up. For our part we prefer adopting Prof. Peck's name rather than the uncouth name proposed for it when described in Europe.

165—Note 20—MYCENASTRUM SPINULOSUM.

The American plant which is common in some sections west of the Mississippi has been stated to be the same as Mycenastrum Corium, the original species, which occurs in Europe We think the plants are different. There is a slight difference in the spores and the American plant has distinct columellæ not present in the other species The fact that there are ever columellæ in Mycenastrum is unrecorded as far as we know. The division wall shown in Fig. 42 is not normal. The specimen sectioned was a "double" specimen.

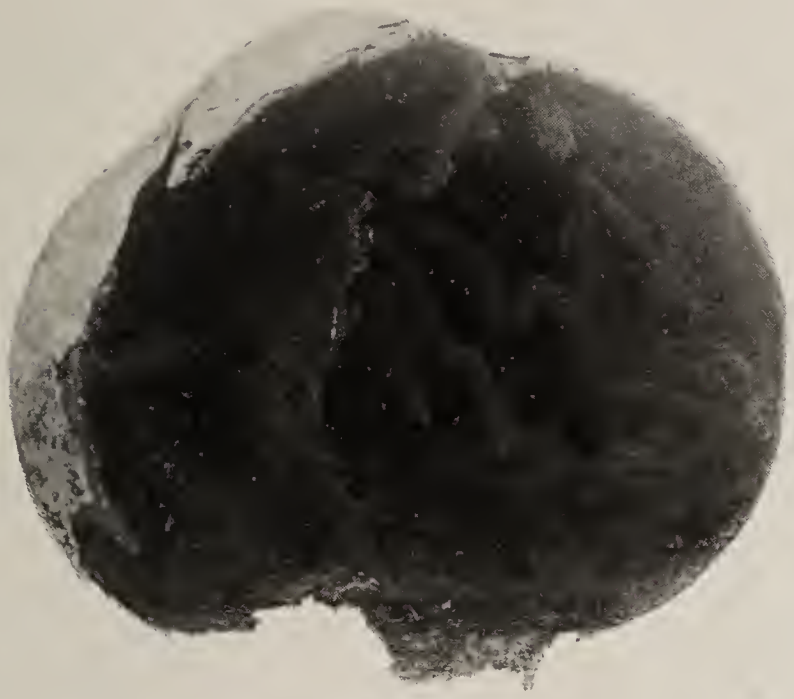

Fig. 42.
Mycenastrum spinulosum, showing columellæ.

166—Note 21—SCLERODERMA VULGARE VAR. VERRUCOSUM.

We present herewith a cut of a plant made from an English specimen. We have received this same plant from Simon Davis, collected in the clear beach sand at Falmouth, Mass., but it must be rare in our country as we have never received the form from any one else. The more verrucose form without the strong rooting base (see Fig. 27), is very common in chestnut woods. We have been much puzzled over Scleroderma species and the conclusions to which we are forced are not at all satisfactory to us. This plant should be called Scleroderma verrucosum and a new name given to our figure 38 without regard to old authors.

Fig. 43.
Scleroderma vulgare var. verrucosum.

167—Note 22—GEASTER LAGENIFORMIS.

A frequent plant, growing around old logs, it has been generally confused in this country with Geaster saccatus. It is "saccate" but differs from that species in having sharper lobes to the outer peridium, and the unexpanded form has an acute point. It is usually of a reddish color, and the outer peridium is often cracked with parallel lines. In this condition it is called Geaster vittatus by Morgan.

Fig. 44.
Geaster lageniformis.

168—Note 23—GEASTER MORGANII.

This is a common plant with us and has always figured in American literature as Geaster striatus. What Geaster striatus of Europe is, I do not know, but it is evidently not this plant as it was described as having "peridium borne on a pedicel 6-7 millimeters long." Geaster Morganii is the same plant as Geaster lageniformis as to size, shape, color, texture, in fact everything, excepting mouth. G. Morganii has a strongly sulcate mouth, G. lageniformis an even mouth. Bresadola considers them

Fig. 45.
Geaster Morganii.
(exoperidium reeurved.)

Fig. 46.
Geaster Morganii, (exoperidium saccate.)

both forms of the same plant (G. lageniformis) but we feel such a difference of mouth worthy of distinct name. With the exception of this plant we know no other Geaster with a sulcate mouth that has any form approximating it in the even mouthed series. Usually the specimens of G. Morganii have the exoperidium saccate, though it is no doubt recurved when the plant is perfectly expanded (see Figs 45 and 46.) We take pleasure in naming it for our friend Prof. Morgan who has done good work with American geasters.

MYCOLOGICAL NOTES.

BY G. G. LLOYD.

No. 9.

CINCINNATI, O. APRIL 1902.

Fig. 47.
Scleroderma Geaster, (with cleavage of peridium.)
(See next page.)

169—SCLERODERMA GEASTER.

We have received from Miss Caroline A. Burgin a specimen of Scleroderma Geaster in which the peridium had split into two layers, the inner layer remaining convex, and appearing very much as though it was a separate peridium There is not a word in Fries' writings to indicate that he ever met this form of the plant. If he had, the name he selected Scleroderma Geaster, would have been indeed most appropriate. With the exception of this accidental splitting of the peridium, Miss Burgin's specimen is Scleroderma Geaster in every respect.

In Volume 6 of the Journal of Mycology, Massee describes a new genus "Stella" which is a Scleroderma in every particular with the exception that it has two distinct peridia. Though his description would indicate that it was a form of Scleroderma flavida instead of Scleroderma Geaster, the question has suggested itself, has he not met the same form that Miss Burgin has met? The plants on which Massee bases his genus he found among Berkeley's specimens of "Scleroderma's". It is passing strange that Berkeley should have overlooked such a characteristic genus as "Stella" is said to be. Massee presents a beautiful picture showing the characters of his genus, but anyone who is an artist can draw a picture. If he will furnish a photograph showing the inner peridium as a distinct peridium and not a cleavage from the outer peridium we will be more strongly impressed regarding the validity of his genus.

It is no doubt a surprise to others as it was to me, to find that Fischer in Engler & Prantl has referred Scleroderma Geaster to a genus Sclerangium, characterized by having two peridia. We are quite familiar with the plant in our collections though we never saw it growing. We have always supposed the plant to have but one peridium, and took up the matter by correspondence with Patouillard. He writes me "Fischer has correctly represented the genus Sclerangium of Leville, characterized by a double peridium. The double peridium exists certainly but the endoperidium can be seen on the ripe specimens only at the moment when it begins dehiscence. This endoperidium shows itself as a thin membrane covering the gleba. Later it is destroyed and falls away in fragments and then the plant has the character with which you are familiar in your dried specimens."

This was all new information to me and I trust Dr. Herbst and others who are fortunate enough to be able to watch the plant ripen will look out for this feature. It is quite a different structure however, from Massee's genus "Stella" (which Fischer includes in this genus) which is represented as having a thick, firm, persistent endoperidium.

170—LYCOPERDON CRUCIATUM.

The plant that we have in this country usually known as Lycoperdon separans, is the same as L. cruciatum in Europe Berkeley always so referred the American plant and Patouillard to whom we sent it so refers it. We have forwarded specimens of the European plant to Prof. Peck and he advises us he recognizes its identity with his species (separans) and will use the European name (cruciatum) in his future writings.

Fig. 48.
Lycoperdon cruciatum
(The cortex peeling off.)

Hollos in his recent article refers both names as synonyms of L. marginatum of Vittadini. It must be admitted that Vittadini's figure, while different as to shape, is very suggestive especially as to the fragments of cortex he shows partly adherent to the margin (hence his name). But Vittadini, a most accurate observer and delineator, describes the spores as "purpurascentia" and as our plant never has purple spores we are not ready to admit its reference to Vittadini's plant. Had the position been reversed and Vittadini's description called for olive spores while our plant had purple spores we would not have attached so much importance to it. It is well known now that the spores of Lycoperdons are probably all olive at early stages of development, and that the only color distinction that can be made are species that have spores that finally turn purplish, and species that never do.

171—A STRANGE PHALLOID EGG.

Mrs. Hannah Streeter of Philadelphia, has kindly sent me a specimen that at first completely puzzled me. It looked just like an acorn seated in its cup. I though it was some new genus of Gastromycetes the outer peridium having separated in a circumscissile way and peeled off. I sent it to Patouillard who says it must be the egg state of some phalloid. On a reéxamination of the spores I should say that there was no question of it, but this does not clear the mystery. What phalloid has an egg state resembling an acorn?

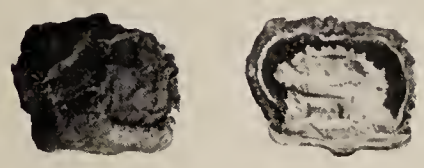

Fig. 49.
Phalloid Egg.

Mrs. Streeter has kindly furnished the following notes about the growing plant. "When found, the lower part simulated in form a shallow acorn cup of wood color, with base as flat as a plate, holding a perfectly smooth, nearly round white ball. It gave no evidence of having parted with an outer peridium. The root-like prolongation looked like the tail of a mouse and was about 1¼ inches long. The plant shrank in drying to about one quarter its size when fresh and the peculiar sculptured surface is the result of shrivelling."

172—LYCOPERDON PSEUDORADICANS.

We have received from F. J. Braendle, Washington, D. C., what seems to us to be a unique species of Lycoperdon. It grew on the "White Moss,"* and has a peculiar root-like appendage penetrating into the moss. This however, is not a root but is *the sterile base of the plant.* It illustrates in a striking manner the adaptability of plants, that this species growing on cushions of dense moss should develop its sterile base into a root-like projection which firmly holds the plant in its peculiar habitat. We know of no other species of Lycoperdon in the whole fungus literature, having a sterile base that assumes any similar form. We have another species of Lycoperdon which grows only in moss, Lycoperdon muscorum (see Gastromycetes Genera, Fig 45). This moss (Polytrichum) is loose and the shape of this plant is quite different from L. pseudoradicans but equally adapted to its place of growth.

Fig. 50.
Lycoperdon pseudoradicans.
(In situ.)

Description:—Peridium globose, contracted at the base, into a long root-like projection which is the sterile base of the plant. Cortex persistent thin, covered with short spinules, arranged in fours, and converging at the apex. Columella large, prominent. Spore mass dark olivaceous brown. Spores small (about 4 mc.) minutely roughened, apiculate. Thickness of capillitium threads varying from one to two diameters of spores.

In the color of spores, cortex, and large columella, this plant is in accord with Lycoperdon piriforme but differs in its peculiar shape, habitat, and larger apiculate spores. It is close to Lycoperdon pratense of Europe both internally and externally (the cortex spines are not so large however). Bresadola writes me that he would consider it a lapsus of this plant. Its peculiar root-like sterile base seems to me however, to be hereditary and could not have been acquired save from a long line of ancestors growing on its particular habitat. It is without question a distinctive character of the plant, so different that I would consider it entitled to specific rank.

Fig. 51.
Lycoperdon pseudoradicans.
(Section.)

* Leucobryum glaucum. We acknowledge our indebtedness to Mrs. E. G. Britton for kindness in naming it. She informs us that "this moss forms dense cushions on the ground in damp woods."

173—BOVISTA AND BOVISTELLA.

As will be noted in the systematic portion of our recent pamphlet "The Genera of Gastromycetes" we propose three subtribes for the Lycoperdeae, viz: Geastrae, Bovistae and Lycoperdae, the latter two distinguished from each other by the nature of the peridia and their habits.

Bovistae are quite different in several points from Lycoperdae but particularly in their manner of spore dispersion. When the Bovistae ripen they break away from their place of growth and are tumbled about by the wind. Nature has provided them with peridia suitable to such a method of spore dispersion. The peridia are firm, parchment-like, elastic, persistent, and their peculiar peridia can be recognized on sight. This nature of peridium is particularly suited to the habits of the plant. As it goes tumbling about, the elasticity of the peridium forces a few spores out with every "tumble" and it is persistent for a long time. Usually specimens last during the winter and perhaps even several years. In this vicinity I have often picked up tumbling specimens of Bovista pila *and yet, I have never seen the plant growing.*

Lycoperdeae when ripe on the other hand do not normally break away from their place of growth. The peridia are flaccid, and the dispersion of the spores is due largely to the *collapsing* of the flaccid peridium, just the reverse of the tribe Bovistae. The genus Bovistella of our view belongs to the subtribe Lycoperdae. The usual distinction of the three genera is as follows:

Bovista—Threads separate, Sterile base none.

Bovistella—Threads separate, plant with a sterile base.

Lycoperdon—Threads proceeding from peridium or columella, plant with or without sterile base.

We would characterize the genera as follows:

Sub-Tribe Bovistae.—Tumblers, Threads separate.—Bovista,

Sub-Tribe Lycoperdae—(True Puff-Ball).

Threads separate—Bovistella.

Threads attached—Lycoperdon.

We know of no species of Bovista with a sterile base but it is conceded that it is not a good character to distinguish Lycoperdon from the proposed genus Globaria. Why then should the "sterile base" be *the character* to distinguish Bovista from Bovistella? We would therefore include in Bovistella plants with and without sterile base (as we do in Lycoperdon). The following species on the authority of Prof. Patouillard is undescribed. When we received it we made no close examination simply judging from its nature that it was a Lycoperdon unknown to me and sent it to Patouillard who advises me that it is "an undescribed Bovista."

174—BOVISTELLA DEALBATA.

Peridium globose, thin, dehiscing by a definite small aperture. Exoperidium a very thin, white, adnate coat, (like a coat of white-wash) at first cracking into areas and finally disappearing. Sterile

Fig. 52.
Bovistella dealbata
(natural size).

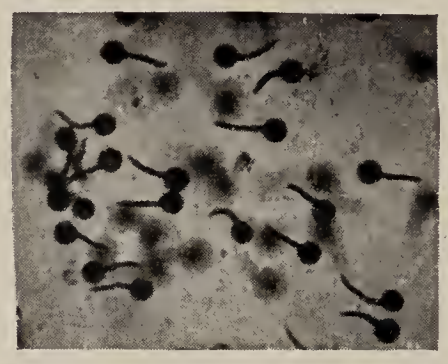

Fig. 53.
Spores of Bovistella dealbata
(Magnified.)

base none. Spore mass brown. Capillitium of separate, slender branching threads. Spores smooth, globose, 4 mc., furnished with long (about 12 mc.) pedicels.

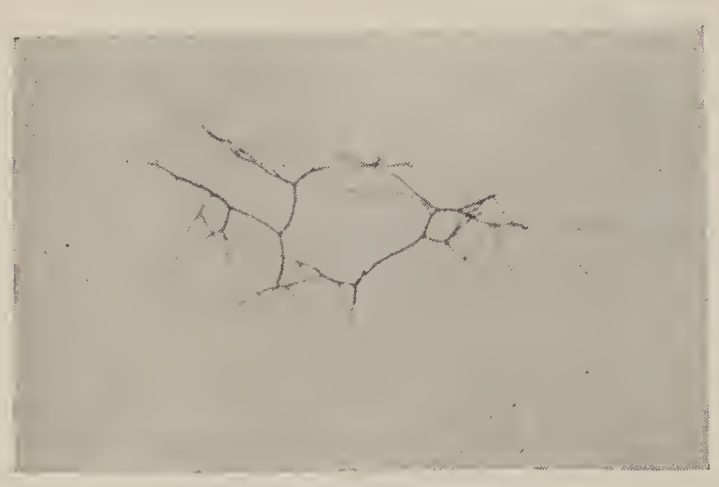

Fig. 54.
Capillitium threads of Bovistella dealbata.
(Magnified.)

This plant was sent me by W. N. Suksdorf and grew on "dry prairies near Rockland, Washington" The largest specimens were about one cm. in diameter. It agrees with Bovista as to internal structure but differs as to habits. It does not when ripe break away from its place of growth but remains firmly attached to the soil by a large tap root. All specimens received had this root and most of them had a lump of adhering soil. The specimens had been "pressed" hence our illustration (fig. 52) is not as characteristic as we should wish.

The plant might be confused with Bovista plumbea but we think is clearly distinct by its habits of growth and very thin exoperidium.

"Vittadini's beautiful and thorough study Monographia Lycoperdineorum is difficult to obtain. No library in Hungary has this work, and it is also absent in Vienna and the Berlin museums The Vienna University and Berlin Royal Library each has a copy. No wonder that the species established by Vittadini were misjudged and that they slowly sink into oblivion."—Hollos

Don't worry, the work of no one that is so accurate and beautiful as Vittadini's will ever "sink into oblivion" no matter how difficult it is to obtain.

175—2nd EDITION OF PROF. ATKINSON'S BOOK

It is very gratifying to learn that the demand for Atkinson's "Mushrooms, edible, poisonous, etc." has exhausted the first edition within a year and that a second edition has been called for. It is to be hoped that this will stimulate others to work in the same lines and same methods to describe and especially to satisfactorily illustrate the plants they meet. Atkinson's book covers only a small field. Every worker in mycology could issue a similar book and not touch the field that Atkinson has covered. To further illustrate the many plants that Atkinson has so well illustrated is useless but a pressing need exist for photo illustrations of hundred of plants that he has not met. We gave the first edition a lengthy review (See Myc. Notes, p. 55). We will simply add that in our opinion it is the most creditable book we have on the subject and every one interested *must have it*.

Price $3.00, Andrus & Church, Ithaca, New York.

176—HYPOCREA (PODOCREA) LLOYDII N. SP. *)

By Rev. G. Bresadola.

Habitu omnino Cordycipitis; stroma longe stipitatum, apice clavula perithecigera, obovato-oblonga, 1½ cm. circiter longa, 3 mm. circiter crassa, farcta, praeditum; peritheciis minimis, immersis, subglobosis, ostiolis punctiformibus prominulis ubique tecta; stipes farctus; glaber, tereti-tortuosus, albidus, 3 cm. longus, 2 mm. crassus; asci cylindracei, octospori, in articulos 16 soluti, 100 — 100 = 4-5 mc.; articuli subcuboideis subglobosi; 3-4 = 3-3 ½ mc.

Habitat — — — — — —?

Cette espèce est très intéressante. Aspect de *Cordyceps*, mais fructification de *Hypocrea*.

Fig. 55.
Hypocrea Lloydii.
(Natural size)

*) A single specimen of this plant was picked up by me in West Virginia last summer. I made no microscopic examination of it but took it for a Clavaria. Had I taken the trouble to examine it I no doubt would have noted that the spores were in asci hence no relation to a Clavaria. I sent it with a photograph to Rev. G. Bresadola who decided that it is a novelty "with habit of a Cordyceps and fructification of a Hypocrea." Should any one meet it again I hope they will carefully observe if it grows parasitic on a tuber or larva. Not knowing at the time I collected it that its relationship would indicate such a habitat I carelessly pulled it up without observing this interesting point.—C. G. L.

177--BOVISTELLA AMMOPHILA.

In connection with our article on Bovista and Bovistella in this issue we are reminded that the plant called by Léveillé, Bovista ammophila belongs to Bovistella having a strong tap root and a sterile base. Years ago McClatchie collected and distributed "Bovista ammophila" from Los Angeles, Cal. We have some of his original specimens, and have seen them in various collections under this name.

Fig. 56.
Bovistella ammophila.
(Copied from Roumeguere.)

We could never see in what way they differ in the slightest from Bovista plumbea. We wrote to Prof. Patouillard for specimens of "Bovista ammophila". He was unable to supply one, but writes "Bovista ammophila Lev. is a rare plant, very little known, even in France. It is usually considered here, on the authority of Quelet, as a form with long root of Bovista plumbea, but this is 'une grosse erreur' I have studied the original specimen of Léveillé in the Museum de Paris and find that it is a Bovistella. It has a hard, rigid tomentose peridium, pedicellate spores, separate capillitium threads, and a well developed sterile base. We have also in France two other species."

"1st, Bovistella radicata Mont., (= Bovistella Ohiensis Morg.)."

"2nd, Bovistella paludosa (Lév.) (= Lycoperdon paludosa Lév. = Calvatia (!!) paludosa de Toni in Sacc Sylloge)."

It is safe to say that Bovistella ammophila has never been collected in this country.

Massee gives a kind of caricature cut of this plant (Ann. Bot. Vol. 4, pl. 2, f. 40). We reproduce an illustration from "Roumeguère Champignons" (fig. 395) which from its close resemblance to the pen sketch that Patouillard sent us we are convinced was made from the original specimen of Léveillé.

178—A MISNAMED PLANT.

Photography was the first work we did with fungi. We knew nothing on the subject of classification but had our plates named by those whom we thought knew. They were distributed as photogravures. One (No. 7) we sent out as Crucibulum vulgare. We had not worked with the fungi very long until we learned that this was *not* Crucibulum vulgare, and yet this plate has been distributed to hundreds of mycologists and no one has ever called our attention to the error. The plant is (teste Patouillard and Bresadola) Cyathus stercoreus. The view that we presented of the plant, looking directly into the cups might mislead one at first sight.

179--ACKNOWLEDGMENT OF SPECIMENS RECEIVED SINCE LAST REPORT.

Our thanks are extended to the following who have aided us by sending in specimens. The nomenclature is as the specimens were named or as we named them when received. In a few instances our views have since been changed as L. separans which we are now calling L. cruciatum (see p. 83). Many Lycoperdons we are unable to name because 1st it is an extensive genus and we have not gotten it clear in our mind, and 2nd many specimens do not afford data for naming with our present knowledge of the genus. We believe that Lycoperdons are characteristic and that when we have once learned them thoroughly we will recognize specimens on sight, but a great deal of work will yet have to be done with them. We are particularly anxious however to get material of this genus.

J. C. ARTHUR, LAFAYETTE, IND.

Paneolus epimyces.

E. BARTHOLOMEW, ROCKPORT, KAS.

Cortinarius rimosus, Calvatia caelata, Lactarius insulsus (?), Mucronoporus Pini, Tylostoma Kansensis, Fomes fraxinophilus, Polystictus pergameus.

C. E. BESSEY, LINCOLN, NEBR.

Lycoperdon (several forms).

M. G. BOHN, MIAMISBURG, O.

Lycoperdon separans, Bovistella Ohiensis.

F. J. BRAENDLE, WASHINGTON, D. C.

Lycoperdon piriforme, Mitremyces lutescens, Scleroderma vulgare, and var. verrucosum, Scorias spongiosa, Helotium citrinum, Clitocybe ectypoides, Fomes sp.

CAROLINE A. BURGIN, PHILADELPHIA, PA.

Scleroderma Geaster. (See page 82).

DR. R. V. CONVERSE, BROWNSTOWN, IND.

Bovistella Ohiensis.

L. E. COOK, CINCINNATI.

Lycoperdon piriforme.

DR. N. M. COOK, MILACA, MINN.

Lycoperdon Curtisii, Bovista plumbea, B. pila.

MRS. DALLAS, PHILADELPHIA, PA.

Lycoperdon (sp.).

SIMON DAVIS, BOSTON, MASS.

Lycoperdon Turneri (?), L. several species, L. separans, L. gemmatum, Rhizopogon several species, Scleroderma vulgare (several specimens).

H. B. DORNER, LAFAYETTE, IND.

Lycoperdon separans.

A fine lot of Calvatia rubro-flava which grew this winter in a hot-house. We have received this plant now from several localities and are convinced we have but one yellow Calvatia in our country, hence Calvatia aurea which we described (Myc. Note 22, p. 11) is a synonym. As "Calvatia aurea" was our first born it is sad to thus early consign it to a premature grave. We feel that we can do this now however more tenderly than to have its young life crushed out by some cruel monographist.

WALTER DEANE, CAMBRIDGE, MASS.

Lycoperdon piriforme (?).

F. S. EARLE, NEW YORK.

Hydnangium recticulatum. (From Alabama.)

ALICE EASTWOOD, SAN FRANCISCO, CAL.

Calvatia sculptrum (?).

E. P. ELY, MONTICELLO, MINN.

Lycoperdon piriforme, L. separans, L. gemmatum.

N. M. GLATFELTER, ST. LOUIS, MO.

Lycoperdon piriforme var. tessellatum.

L. A. GREATA, LOS ANGELES, CAL.

Calvatia fragilis, Mycenastrum spinulosum.

DAVID GRIFFITH, WASHINGTON, D. C.

Bovista plumbea (from Oregon), Mycenastrum Corium (from Nevada), Tylostoma (from New Mexico), Battarrea Griffithsii (from New Mexico).

E. T. HARPER, CHICAGO, ILL.

Fomes pinicola, Polyporus (two spec.).

R. M. HARPER, NEW YORK, N. Y.

Geaster hygrometricus (from Georgia).

DR. L. HOLLOS, HUNGARY.

Lycoperdon perlatum, L. echinatum, L spadiceum, L. piriforme, L. pusillum, L. hyemale, L. umbrinum, L purpuraceum, L. furfuraceum, L. hirtellum, L. lividum, Calvatia pistilliforme, C. cyathiformis, C. caelata, Tylostoma mamosum, T. squamosum, Elaphomyces rubescens, E. muricatus, E pyriformis, E. granulatus, Balsamia platyspora, Melanogaster variegatus, Tuber aestivum, Chairomyces meandriformis.

E. W. D. HOLWAY, DECORAH, IA.

Geaster saccatus (from Mexico).

H. H. HUME, LAKE CITY, FLA.

Lycoperdon pusillum, L. separans, Polysaccum crassipes.

WM. KNOX, CLEVELAND, O.

Lycoperdon piriforme.

MRS. KARL LANGENBECK, ZANESVILLE, O.

Phallus Ravenelii.

B. O. LONGYEAR, AGRIC. COLL, MICH.

Lycoperdon pyriforme var. tessellatum, Tylostoma fibrillosum, Scleroderma flavidum.

P. MAGNUS, BERLIN, GERMANY.

Bovista plumbea, Lycoperdon gemmatum, Scleroderma verrucosum.

E. R. MEMMINGER, FLAT ROCK, N. C.

Lycogala epidendrum.

C. E. MONTGOMERY, PORTSMOUTH, N. H.

Lycoperdon piriforme, L gemmatum (?), Geaster Schmidelii, Crucibulum (a plant that impressed me as being quite different in color and shape from Crucibulum vulgare, but both Patouillard and Bresadola refer it to that species).

A. P. MORGAN, PRESTON, O.

Geaster striatulus (from Florida).

G. E. MORRIS, WALTHAM, MASS.

Lycoperdon piriforme (several specimens), L. pussilum (?), L. gemmatum, L. pedicellatum, Geaster triplex, G fornicatus var. multifidus, Cordyceps capitata, Scleroderma verrucosum, S. vulgare, Calvatia elata

H. PAGE, BOSTON, MASS.

Rhizopogon luteolus, R. rubescens.

N. PATOUILLARD, FRANCE

Lycoperdon hiemale, L. velatum, L. atropurpureum, L. caelatum, L. pratense, L. gemmatum, L pusillum, L. cepiforme, L. furfuraceum, Bovista plumbea, Scleroderma verrucosum, S. aurantium, Hydnangium carneum, Phellorina Delestrei.

CHAS PECK, ALBANY, N. Y.

Lycoperdon glabellum, L. separans, L. subincarnatum, L. pedicellatum, Fifteen other specimens of Lycoperdon, Calvatia cyathiformis C. elata, Scleroderma verrucosum.

P. H. ROLFS, MIAMI, FLA.

Geaster hygrometricus.

MRS. SAMS, NEW SMYRNA, FLA.

Myriostoma coliformis.

SUSAN J. SANGER, BOSTON, MASS.

Scleroderma vulgare.

J. GILBERT SELBY, EGLON, W. VA.

Lycoperdon spec., L. gemmatum, L. muscorum, Bovista pila

A. B. SEYMOUR, CAMBRIDGE, MASS.

Calvatia cyathiformis, C. craniiformis, Lycoperdon atropurpureum, L. hirtum, Several specimens of Lycoperdon.

C. L. SHEAR, WASHINGTON, D. C.

Geaster Bryantii (Texas), Mitremyces lutescens (Washington).

MRS. HANNAH STREETER, PHILADELPHIA, PA.

Ceriomyces alveolatus, Lentodium squamulosum, Curious phalloid egg (see p. 83), Daedalea Kansensis, Scleroderma vulgare.

W. N. SUKSDORF, BINGEN, WASH.

Scleroderma—several species, Lycoperdon piriforme, L. pussilum, L. gemmatum, L. coloratum, Catastoma circumscissa, Rhizopogon several species.

W. J. TEETERS, IOWA CITY, IA.

Mycenastrum spinulosum, Bovista pila, B. plumbea, Calvatia caelata, Geaster mammosus.

F. K VREELAND, COLORADO SPRINGS, COL.

Catastoma subterranea, Calvatia fragilis (several specimens), Tylostoma sp., Lycoperdon sp.

C L. WAKEMAN, EAST BRANCH, N. Y.

Bovista pila.

H. E. WARNER, WASHINGTON, D. C.

Calvatia cyathiformis

L. H. WATSON, CHICAGO, ILL.

Scleroderma vulgare, S. "verrucosum", Geaster saccatus, G. hygrometricus, Bovista plumbea, Tylostoma campestre, Calvatia (immature), Lycoperdon gemmatum, L. hirtum (?), L. pyriforme, Several specimens of Lycoperdon.

A C. WINTERS, CORVALLIS, OREG.

Cantharellus (new species ?)

180—DR. HOLLOS ON GASTROMYCETES.

A most important paper has recently been published in "Termeszetrajzi Füzetek" by Dr. L. Hollos of Hungary. It is in Hungarian but fortunately also translated into German, which makes it available to the ordinary student. Dr. Hollos has for years made an extensive collection and study of Gastromycetes and his conclusions are particularly valuable. There are two classes of botanists, the liberal and the radical. The former allows a certain latitude for variation of his species, the latter makes a species out of every slight form. As will be noted from his introductory remarks and synonyms, Dr. Hollos is extremely liberal in his views concerning species.

It seems to us that whoever observes any form of life must be impressed with the fact that living organisms are subject to change according to environments. They are capable of adapting themselves to the conditions under which they are placed, and it is evident that such environments cause variation in size, shape, color, etc., that are hereditary. That our plants have had a common origin and that the study of classification is primarily a study of genealogy is no less evident. No rule can be laid down to define a species. It is largely a matter of individual opinion, of individual conviction. Two plants that impress one person as entirely distinct, may appeal to another person as being only forms of the same plant, or vice versa. There can be no authority in such matters, we can only defer to the opinion of those who have had the largest experience, and I believe the more experience one has the more liberal one becomes.

Dr. Hollos has completely upset many of the customary names on the basis of "priority." If there was ever a delusion it is the idea that any permanency can be established on such principles. Beautiful in theory, it is a failure in practice. Announced as a means of reaching stability in nomenclature, it has caused more confusion and will cause more confusion than all other agencies combined. A monographer proposes a lot of changes and the next man to work over the field digs up a lot of older names and changes them all over again. Dr. Hollos digs up Disciseda circumscissa to replace Morgan's Catastoma circumscissum. If he had dug a little deeper in the archaeological rubbish of the past he would have found Disciseda candida for the same plant as Bovista candidum of Schweinitz is Catastoma circumscissum. Morgan was the first man to illustrate and describe the genus so that others knew it. Hollos himself sent out this plant only a couple of years ago as "Bovista". He was enabled to decide that it was Disciseda only by what he had learned of the genus from Morgan's publications and specimens. Schweinitz did not describe the plant so that anyone could recognize it and I only knew it to be his Bovista candidum from examination of his specimen. If this specimen had perished as have so many of his specimens, "Bovista candidum" would always be a puzzle. Hollos acknowledges that Czerniaiev did not describe the genus so that its species can be recognized. We submit that it is unfair, unjust, illogical, to displace the excellent

work that Morgan did, for the crude work done with this plant by Schweinitz and Czerniaiev. Nor is anything gained by it for we have no assurance that Schweinitz was the first to pick up this plant and give it a name. The musty old herbariums of the world may have the plant stored away under a dozen names for all anyone knows.

We will now reproduce a translation (by Sigmund Waldbott, a competent German scholar) of Dr. Hollos' introductory remarks and will take the liberty of making a few comments by way of foot-notes.

INTRODUCTORY BY DR. HOLLOS.

"The shape, size and color of one and the same species of fungus are subject to considerable variation, a fact which has misled many mycologists and caused them to describe already known species as new. Accordingly, many superfluous names of fungi must be eliminated after establishing their identity. Hence our science, suffering surfeit with bad species introduced by error, ignorance or vanity, requires thorough purification."

"For the present I wish to speak principally only of such Gastromycetes as have come into my hands for many years in different form, size and color, which enabled me to give them a thorough study. Thus I discovered that many mycologists have been led into error on account of variableness of specimens which by no means should be taken as characterizing differences in species, and I observed that one and the same species has been described under many names, each one as a distinct and good species."

"To give a comparison, I encountered such cases that impressed me in the same manner as if one were to describe the unripe, the green, the worm-eaten, the fallen, the withered, the yellowish or reddish, the hard or soft, the long or short-stemmed, or the stunted fruit of one and the same pear tree each under a different name as different species of pears."

"Would it not be ridiculous for a person to assert that a baby and an old man, the straight-haired or the woolly-haired, or the bald-headed, the lean or the fat, each one constitute a different species of man ?"

"Faith in Science is liable to be shaken when it becomes evident how many species already known in scientific works have been described under new names as new species, and how many wrongly determined are contained in exsiccatae and museums."

"From the following collected synonyms it is plain how careful and cautious we must be in establishing new species. New species should never be described without referring to specimens in different states of development, without rich literature and without good material for comparison Describing a known species as a new one aside from being superfluous, not only renders the survey difficult, but it also destroys confidence in science, and the author by such procedure acquires only temporary and doubtful glory. Thanks to the species-manufacturing mania of his predecessors, the true investigator is compelled to waste the greater part of his energy and time with the com-

pilation of names of the same meaning, synonyms and superfluous empty words."

"If Nature had spent its millions of years in experimenting, it probably could not have produced as many different species of fungi as have been scribbled together by mankind in one century. In the 14 volumes of Saccardo's Sylloge Fungorum, 47304 species are described; the next forthcoming volume will probably contain 5200 additional species, and thus, about 52 thousand species will be made known. It is probable that upon thorough revision, many can be eliminated, although it can not be denied that there are also some new good species, not heretofore described."

"Not only species but whole genera should be thrown overboard, the names of fungi should be thoroughly revised if we are to consider mycology a pure science."

"Some of the American Mycologists probably thought every fungus found in their own country to be different from the European species, thus they often described as new, whole batches of such species, without taking the European literature (*) into account, although already known from Europe. They did not notice that some of the fungi are cosmopolitan in their nature. Especially Gastromycetes, mainly those among the dust-bearing, are ubiquous because the chief condition of their existence depends, not on the climate, but on the soil. A cosmopolitan fungus preferring sand, grows as well in the sand of the Hungarian lowlands as in tropical Africa or in the sand of the temperate Siberian climate."

"Thus, Mycenastrium Corium (Desv.) grows in the prairies (**) of Europe, Asia, Africa, America, Australia, mostly in sandy soil; but this fungus has been described under a different name according to each location. It figures in Saccardo's Sylloge Fungorum under 12 different names, each one to represent an individually good species."

"Secotium agaricoides (Czern.) is also a cosmopolitan fungus, growing in all parts of the earth. This fungus in Saccardo's Sylloge has 8 names, purporting to represent 8 different fungi, although these 8 names are those of one and the same fungus."

"No doubt it is more convenient, less troublesome, and brings

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(*) This statement is very much in the nature of a joke. It is not in the bounds of possibility for the most conscientious worker to reach satisfactory conclusion from the "literature" of fungi. The method that Hollos pursues of examination of specimens is the only method producing any kind of stable results. But it is not possible for any one person to cover the whole field. Hollos has only done it in part, in the Museum at Berlin. If he had gone on to Kew he would have learned much more and probably unlearned some of the conclusions he reached at Berlin. The same applies to Paris, to Geneva, to Lund, to Philadelphia, to New York, in fact to every place where a collection of these old specimens is stored. To criticise American botanists because they fail to recognize their plants from the "literature" of Europe is out of the question. While American botanists have done their share of this kind of work it must not be forgotten that European botanists have done more than their share. American mycology would be in much better position if Berkeley's work with American plants could be wiped off the slate. While as to Montagne's, they are nothing but a set of puzzles that never will be solved.

We hold that "new species" should not be described until specimens have been submitted for an opinion to some person familiar with the plants of Europe and there are to-day two men in Europe, Bresadola in Tirol and Patouillard in Paris whose experience entitles them to be ranked as experts.

But even after *they* have passed on a plant there is no absolute guarantee that the plant will not turn up under another name in some old museum or be found imperfectly described or crudely figured in some old literature.

(**) "Hutweiden"—literally Agaric fields. The German word "Hut" hat is commonly applied to a pileus.—(Translator.)

more glory even if of short duration, to propound a new species than to seek around among those known and eventually to establish the occurrence of an already described species in a new location."

"I will close this brief introduction with the following motto adopted from the works of Vittadini" :

"*Melius est notas exactius definire species, quam novas plerumque incertas proponere.*"*

RÉSUMÉ OF HOLLOS' WORK.

Lack of space prevents us from considering in detail the conclusions reach by Hollos, which however, at this time would be superfluous as we expect to do so successively as we present each plant. It is sufficient for the present to say that over Two Hundred and Thirty described Gastromycetes have been reduced by Hollos to *Thirty*. With most of these conclusions we are in perfect accord, and have even forestalled many of them in Mycological Notes. In some instances however, we feel Dr. Hollos has been too liberal in his view of the species but this is a subject for future discussion.

181—OUR NEW LIBRARY BUILDING.

We have just completed a commodious, modern building located at No. 224 West Court St., Cincinnati, Ohio, which will be exclusively devoted to our library and collection. It is four stories high, and one floor (about 80x20 feet) is devoted entirely to specimens. Our specimens of "puff-balls" are contained in boxes made on the basis of the smallest size as a unit. This idea we borrowed from the New York Botanical Garden where we first saw it in operation. For the present we have placed no shelving excepting along the walls but a short calculation shows us that we have now shelf room for 61824 specimens. By putting racks in the center of the room we can double the capacity. So we have abundant room for all the specimens that our friends may favor us with and we hope that every reader of our little pamphlet, will make it his or her business to pick up "puff balls" whenever they notice them and send them in to us It is only by accumulation of abundant material from many localities that any thorough work can be done with any branch of natural history. Let every one constitute himself or herself a committee of one to place in the building a complete series of specimens representing all the various puff balls that grow in his or her immediate vicinity.

(*) It is better to define known species more accurately than to propound new ones that are for the most part uncertain.

MYCOLOGICAL NOTES.

BY G. G. LLOYD.

No. 10.

CINCINNATI, O. SEPTEMBER 1902.

182—BOLETUS BETULA.

By H. C. Beardslee.

Pileus firm, hemispherical to convex, red tomentose or squamulose, often rimose, red or yellowish-red; flesh firm, yellowish; tubes adnate, often somewhat depressed around the stipe, dingy yellow or yellowish-green, mouths rather large; stipe long, equal or tapering upward, shaggy with rough winged reticulations. Pileus 1½ to 3 in. broad, stipes 3–10 in. long. 3–6 in. thick.

Fig. 57. Boletus Betula. (Section young plant.)

In woods, very common on the Asheville plateau.

Three species of shaggy-stiped Boleti have been described by American Mycologists. B. Betula was first described by Schweinitz, but although he recorded it as common in North Carolina and Pennsylvania, it does not seem to have been recognized since his day, the shaggy-stiped species which is found quite generally in the northern states, having been universally referred to a species later described by Frost as Boletus Russelli.

As they are described these species would seem to be fairly distinct. B. Betula has the pileus "viscose and shining in wet weather," the "stipe attenuated downward," and the "tubes yellow." B. Russelli has the "pileus dry, tomentose squamulose or fasciculately red pilose," the "stipe equal or tapering upward," and the "tubes dingy yellow or yellowish-green."

The plant which is abundant on the Asheville Plateau is clearly B. Russelli. It corresponds perfectly with Frost's excellent description and with the plant which we have found in Ohio, Illinois, Maine, and New York.

Continuous observation of it during the summer however, has convinced us that it is also B. Betula. The pileus is normally dry, but during the continuous rains to which this region is liable during parts of the summer, it takes on the features described by Schweinitz. The pileus becomes "viscose and shining, and develops a set of reticulating cracks so that it might well be termed "tesselately rimose."

The stipe is more often as described by Frost, but specimens may be found which are "attenuated downward." This brings the two plants into close coincidence and renders it nearly certain that our common plant is B. Betula. This conclusion is more probable when we remember that the rough shaggy stipe was made the important character in the original description and that Schweinitz found his plant common in both North Carolina and Pennsylvania.

Mr. Lloyd has observed Boletus Morgani in all its stages and considers that it is a state of B. Betula rather than a distinct species.* This would reduce our three species of shaggy stiped Boleti to one and unite them under the oldest and best name.

Fig. 58.
Boletus Betula.
(A small specimen.)

*During a collecting season several years ago I had opportunity to study "Boletus Morgani." When Prof. Peck described Boletus Russelli and Boletus Morgani he apparently did not know of Schweinitz's species. Later in his monograph on the Boleti he distinguished B. Morgani from B. Betula, by the bright red alae of the stem. The distinction is of no value. When the plant is in its prime the alae are bright colored but they fade out as the plant gets older and assume the uniform dull yellow ascribed to them by Schweinitz.—Lloyd.

183—HYPOCREA ALUTACEA.

Prof. Atkinson having kindly written me and stated that he thought Hypocrea Lloydii described in last issue of Mycological Notes to be the same as Hypocrea alutacea, we have referred his letter to Rev. Bresadola, who replies as follows:

Fig. 59.
Hypocrea alutacea,
(natural size.)

"Le Prof. Atkinson a, peut-être, raison de considérer Hypocrea Lloydii Bres. identique à Hyp. alutacea (Pers.) Je n'ai jamais vu cette dernière espèce pour pouvoir les comparer.

Comme les Auteurs considèrent *H. alutacea* parasite de *Clavaria ligula* ou *Spathularia flavida*, j'avais étudié le tissu de ces deux espèces et le trouvant assez distinct de celui de H. Lloydii, je l'avais considéré comme espèce diverse.

"Depuis considérant les figures de Hyp. alutacea chez Nees System, etc., Tab. XI, f. 304 et chez Tulasne Selecta Fung. Carp. Vol. III,. tab. IV, f. 1–6, qui représentent des spécimens évidemment anormaux du *Clavaria* ou *Spathularia*, tandis que votre spécimen de *Hyp. Lloydii* est très normal, j'avais considéré votre espèce autonomique et pour cela je l'avais classée parmi le Hypocrea-Podocrea. Les hyphes du tissu de *Hyp Lloydii* sont plus molles, plus adnexées et moins larges que chez *Spathularia flavida* et plus larges que chez Clavaria ligula sans y voir des hyphes mycéliales. Voilà donc les raisons de ma détermination."

"Si Hypocrea Lloydii est vraiment identique à Hypocrea alutacea, espèce m'étant inconnue comme je l'ai déjà dit, je ne crois pas à la nature parasitaire de cette dernière espèce."

It will thus be seen that Bresadola accepts the plants as identical but throws much new light on the nature of the plant. Hypocrea alutacea is not a parasitic plant as has been usually accepted, but is *autonomous*.

Prof. H. C. Beardslee writes me that he has carefully studied this plant to learn whether it grew parasitic on a tuber or larva. He has never observed a specimen so growing, and decided that it does not grow on such a host. I judge from what Beardslee writes that the plant is not rare with him.

184—LOOKING BACKWARDS.

"In my opinion it is the very priority law which defends science against these species manufacturers that grow in mushroom numbers. If a certain species is unknown to a mycologist, i. e., if it is *nova species to him*, but long before known to science, then it stands to reason that the new name as a matter of course is entirely superfluous and non-meritorious." Extract from private letter from Dr. Hollos.

We fully agree with all this but are afraid we cannot agree with what constitutes "making a plant known to science." Simply picking up a plant, calling it something, sticking a specimen away in some collection, "describing" it so that others cannot know it from the description, does not make a plant "known to science." It simply proposes a puzzle for science to solve. Schweinitz did not make "Bovista candida" known to science. Fries thought it acceded to Lycoperdon, Sprengel that it was Calvatia gigantea, Morgan that it might be Bovistella Ohiensis. Czerniaiev did not make the genus "Disciseda" known to science. The species cannot be determined to this day and never will be determined unless some of Czerniaiev's plants are found. It is put among the "ungenügend bekannte Gattungen" in the recent Engler & Prantl. Morgan *did make Catastoma known to science* He described it and illustrated it so that everybody knew it. Hollos knew it and was enabled by *that knowledge alone* to decide that it was the same as the genus Disciseda. I knew it and recognized Schweinitz's "Bovista candida" as the same. Now it is working backward, like a crawfish walks, and it is not just to Morgan for Hollos to try to break down Morgan's work on *what he learned from Morgan* any more than it would be for me to use what I have learned from Hollos and Morgan and break down both their works and call the plant "Disciseda candida." And yet "priority" upholds it, at least for the time being, until somebody digs up some other old name.

185—AN INEXCUSABLE BLUNDER.

On page 10 of Genera Gastromycetes, and again under fig. 19, page 14, we have written Nidularia striatus for Cyathus striatus. This was simply a *lapsus pennae.* The genus Cyathus is the most frequent genus of Nidulariaceae, and we have some half dozen species in this country. Cyathus striatus is the most common species. We have only one collection of the genus Nidularia, some specimens kindly sent us by Dr. Herbst. In this connection we trust all our readers will bear in mind that we are particularly anxious to obtain specimens of "bird nest fungi"; and will not fail to pick up and send us all that they find.

186—ACKNOWLEDGEMENT OF SPECIMENS RECEIVED SINCE LAST REPORT.

We desire to thank each contributor who has sent specimens aiding us to gain a knowledge of the Gastromycetes. We feel that we have a fair knowledge now of most of the genera excepting Lycoperdon and Tylostoma. Their are many puzzles in these two genera yet to be solved. In collecting Lycoperdons, please collect abundantly of the mature forms and a few young to show the cortex. Where Lycoperdons grow it is often as easy to pick up a cigar box full as not. Always dry Lycoperdons (simply laying them aside for few days) before sending. Two species of Lycoperdon (gemmatum and pyriforme) are common and not specially desired, if you know them, but everything else particularly we are anxious to get.

PROF. AIKEN, CINCINNATI. Elaphomyces decipiens. (Type from Vittadini.)—L. ARNOULD, FRANCE. Calvatia caelata. —MISS BARRETT, JAMAICA. Calvatia (sterile base), Cyathus (unknown to me), Phallus indusiatus, Clathrus columnatus.—H. C. BEARDSLEE, N. C. Mitremyces Ravenelii, Lycoperdon echinatum, Geaster vellereus, Scleroderma Geaster, Mitremyces cinnabarinus, Geaster vulgaris? (Cleveland, O.), Lycoperdon, two specimens.—A. S. BERTOLET, CANADA. Polyporus volvatus, Helvella sphaerospora, Geaster triplex.—E. BETHEL, COLO. Tylostoma subfuscum, Catastoma subterranea, Bovista plumbea var. ovalispora, Bovista pila, Geaster minimus.—F. J. BRAENDLE, WASHINGTON, D. C. Clavaria pistillaris.—G. BRESADOLA, AUSTRIA. Lycoperdon candidum, L. hiemale, L. umbrinum, L. excipuliforme, L. atropurpureum, L. pusillum, L. pratensis.—C. E. BROWN, WISC. Bovista plumbea, Lycoperdon coloratum, Geaster saccatus, Geaster triplex, Tarzetta verruculosa, Lycoperdon gemmatum, Scleroderma verrucosum, Crucibulum vulgare, Cyathus striatus, Cyathus vernicosus.—E. V. BURKE, CALIFORNIA. Helvella (Spe?). — MISS C. CASTLE, HAWAII. Lycoperdon near gemmatum.—F. CAVARA, SICILY. Arcangelsilla Borziana, Gyrophragmium Delilei.—W. N. CLUTE, N. Y. Cyathus vernicosus, Cyathus stercoreus, Geaster minimus (La.)—CLARA E. CUMMINGS, MASS. Geaster hygrometricus, Mitremyces cinnabarinus, Lycoperdon pyriforme, Lycoperdon (2 species), Scleroderma vulgare var. verrucosum, Lycoperdon gemmatum, Cyathus striatus, Crucibulum vulgare, Cyathus Lesueurii. —MRS. GEO. M. DALLAS, PENN. Lycoperdon pyriforme, L. cruciatum, L. gemmatum, Scleroderma verrucosum, Crucibulum vulgare, Geaster hygrometricus.—SIMON DAVIS, MASS. Scleroderma verrucosum.—E. P. ELY, TEXAS. Secotium (unknown to me), Lycoperdon (2 specimens), Bovistella Ohiensis, Mycenastrum spinulosum, Cyathus stercoreus (Woodbridge, Ct.), Calvatia rubroflava (Westville, Ct.), Bovista plumbea (Minn.) — WM. FAWCETT, JAMAICA. Scleroderma vulgare.—O. E. FISCHER, MICH. Lactarius calceolus, Geaster (new to me), Scleroderma verrucosum, Scleroderma vulgare,

Lycoperdon gemmatum, Polystictus cinnamomeus. — DR. W. M. GLATFELTER, MO. Bovistella Ohiensis, Polysaccum pisocarpium.—L. A. GREATA, CAL. Battarrea Digueta.—E. T. HARPER, ILLS. Polystictus versicolor. — ELIZABETH HARRIS, MASS. Lycoperdon pyriforme.—G. G. HEDGCOCK, NEB. Lycoperdon (Sp.)—DR. L. HOLLOS, HUNGARIA. Calvatia candida, Geaster floriformis, Geaster pseudolimbatus, Geaster pseudostriatus, Geaster Bryantii.—E. M. HOLMES, LONDON, ENG. Fomes obliqus, Polyporus betulinus, Polyporus sulphureus, Daedalea quercina, Geaster Bryantii, Polystictus abietinus, Polyporus (2 species), Polystictus versicolor, Pleurotus ostreatus, Fomes, Exidia glandulosa, Stereum hirsutum, Stereum purpureum, Hirneola auricula-judas, Daldinia (2 species), Polyporus adustus, Xylaria polymorpha.—A. HOWARD, BARBADOS, M. D. Poronia oedipus.—FRANK HUNTSMAN, O. Cyathus stercoreus, Polyporus.—T. ICHIMURA, JAPAN. Geaster hygrometricus.—DAVID L. JAMES, MICH. Marasmius oreades, Lenzites saepiaria, Tylostoma fibrillosum.—W. JEKYLL, JAMAICA. Arachnion (new species).—O. KATZENSTEIN, N. C. Lycoperdon cruciatum.—G. LAGERHEIM, SWEDEN. Lanopila (So. Amer.), Scleroderma (Stockholm), Hydnangium Söderströmi (So. Amer.)—J. U. LLOYD, BRITISH COLUMBIA. Rhizopogon, Fomes, Trametes pini, Lycoperdon (2 specimens), Polyporus, Peziza (2 specimens).—JOHN MACOUN, OTTAWA, CAN. Gyromitra, Gyromitra esculenta, Geoglossum.—JAMES MILLER, CINCINNATI, O. Hydnum septentrionalis.—W. S. MOFFATT, ILLS. Lycoperdon gemmatum, Lycoperdon cruciatum, Lycoperdon coloratum, Geaster limbatus, Tylostoma, Bovista plumbea, Geaster saccatus, Geaster Schmidelii, Polyporus cinnabarinus, Geaster triplex, Scleroderma flavidum.—C. E. MONTGOMERY, N.H. Crucibulum vulgare.—JOHN NELSON, MAMMOTH CAVE, KY. Calvatia cyathiformis, Calvatia craniiformis, Bovistella Ohiensis, Polysaccum crassipes, Fomes lucidus, Fomes graveolens.—TOJI NISHIDA, JAPAN. Lycoperdon pyriforme, Geaster hygrometricus.—M. PATOUILLARD, FRANCE. Battarea Digueti (gleba of type specimen.)—C. H. PECK, NEW YORK. Lycoperdon (Sp. ? from Hawaii).—GREENWOOD PIM, IRELAND. Cyathus vernicosus, Cyathus striatus, Mutinus caninus, Crucibulum vulgare.—C. V. PIPER, WASHINGTON. Lenzites saepiaria, Trametes pini, Echinodontium tinctorium, Melanogaster ambiguus, Chlamydopus clavatus, Calvatia caelata, Lycoperdon (2 specimens), Cyathus, Cyathus striatus, Mycenastrum spinulosum, Catastoma circumscissa, Crucibulum vulgare, Polyporus volvatus, Tylostoma minutum.—C. E. PRESTON AND A. L. DEAN, MASS. Geaster hygrometricus, Lycoperdon cruciatum, Lycoperdon pyriforme. —C. B. ROBINSON, NOVA SCOTIA. Geaster hygrometricus.—CARLETON REA, ENGLAND. Geaster fornicatus.—MRS. SAMS, FLORIDA. Cyathus stercoreus.—E. P. SHELDON, OREGON. Lycoperdon (species).—JARED G. SMITH, HAWAII. Scleroderma vulgare.—E. B. STERLING, COLO. Phallus impudicus. Calvatia caelata Catastoma subterranea, Secotium acuminatum, Calvatia lilacina, Lycoperdon Cyathus vernicosus Trametes Trogii, Mycenastrum

spinulosum, Scleroderma vulgare, Catastoma circumscissa, Secotium rubiginosum,? Tylostoma albicans, Tylostoma poculum. Mr. Sterling is the most satisfactory collector that is sending in specimens. He collects most abundantly. Hundreds of specimens of Mycenastrum spinulosum, show every variation from a rough scaly plant (no one else has ever sent) to the usual smooth form. A cigar box full of Tylostoma albicans. exhibits the plant in every form and shows that it has characters the author of the species never suspected. If every correspondent sent material as abundantly as Mr. Sterling, it would not be long before the last puzzel in relation to American Gastromycets would be cleared up.—G. E. STONE, MASS. Anthurus borealis (Photographs of Anthurus borealis, Phallus duplicatus, Phallus Ravenellii).—PROF. CHAS. VAN BAMBEKE, BELGIUM. Scleroderma verrucosum, Scleroderma vulgare, Calvatia caelata, Cyathus vernicosus, Tylostoma mammosum.—F. K. VREELAND, NEW MEXICO. Tylostoma campestre, Tylostoma mammosum, Cyathus stercoreus (N. J.)—H. E. WARNER, WASHINGTON, D. C. Geaster rufescens.—DR. L. H. WATSON, ILLS. Mycenastrum spinulosum, Lentinus Berterii, Tylostoma species, Tylostoma fibrillosum, Secotium acuminatum, Bovista plumbea.—HOLLIS WEBSTER. Bovista plumbea var. ovalis (N. H). Lycoperdon coloratum (Vt). Catastoma circumscissum (Vt)—MRS. WHETSTONE, MINN. Cyathus stercoreus, Xylaria.

187—HOW LITTLE WE KNOW.

How little we know and how easy it is to be mistaken is strongly impressed on us by a recent experience. We received from W. Jekyll, Jamaica, what we thought were little "puff balls". They were the same collection and appeared to us to be the ripe and immature specimens of the same plant. On examination under a microscope we noticed little "balls" which we supposed were peridioles, which would have made the plant an Arachnion. As the genus Arachnion consists of only one species as really known, namely, A. album, with which we are quite familiar, we readily supposed this was a new species of Arachnion and so wrote Mr. Jekyll. We forwarded specimens to Prof. Patouillard and he advises us that we have two different plants. What we had taken for the mature Arachnion being a Globaria, the spores agglutinate by insects, and what we had taken for the young specimens are specimens of the genus Endogone. In a re-examination of the "little balls" and breaking them by pressure under a cover glass, we readily see our error in this respect. The genus Endogone is something entirely new to us. It looks exactly like a young Gastromycetes but on close examination we note that it does not have a peridium. We expect to study up the subject and will make further notes on the subject. As we have not published our "new species" of Arachnion no particular harm is done, but we merly give the illustration as it strongly shows how little we know on the subject and how easy it is to be mistaken.

188—MORE ABOUT GEASTERS.

Geaster saccatus (See Geaster, p. 37) is a common plant in this country. It grows in rich soil in the woods. We state in our pamphlet that the unexpanded plant is globose. This is an error as we learn from our observations in the woods this summer. *The unexpanded plant is acute.* This makes it hard to define the difference between "saccatus" and "lageniformis". Saccatus is a smaller plant with not as acute segments but this distinction is only comparative and not satisfactory.

Geaster triplex has reached me from many collectors this year and I have gathered it abundantly in the woods of Michigan. It usually grows around the roots of trees, and remains for a long time in an unexpanded (acute) form. The freshly opened plants are not reddish-brown but greyish, but they become reddish-brown with age. This plant common with us is seemingly rare in Europe. We do not have it from any foreign collector. Were it as common in Europe as with us, we would think it certainly the original "G. rufescens".

189—GYROPHRAGMIUM DELILEI.

Doubt has been expressed to me (in conversation) regarding the accuracy of statements of page 68 of Myc. Notes regarding the identity of our western plant with Gyrophragmium Delilei of Europe. We welcome such criticisms for we are seeking the truth only, but we never had any question in our mind on the subject as the information was communicated to us by Prof. Patouillard and we have learned to depend implicitly on what he says.

In this connection it is wonderful to me, the thorough manner in which both Patouillard and Bresadola have mastered Mycology. Hundreds of specimens have been sent by me to them and ninety-nine instances out of a hundred, their determinations were absolutely identical. This is not the result of any accident, it is from *the knowledge that each has of the subject.* If American mycologists would submit to either of them their supposed "new species" before publishing, our literature would not be burdened with so many worthless names.

But I am straying away from what I intended to say. We have just received a specimen of Gyrophragmium Delilei from F. Cavara of Sicily and if anyone doubts its identity with our American plant we invite a comparison in our museum.

190—GATHERING PUFF-BALLS.

Experience shows that it is very simple to gather good specimens of "puff balls." First, pick them up abundantly, twenty or more specimens of each kind, that is if you find them abundantly. Gather them when ripe, and if young ones are growing in the same collection, gather one or two of the young ones and send with the lot. Second, do not send them when you collect them, but spread them out to dry, keeping each kind together of course and send only when thoroughly dry. Third, send them in a box in such a way that they will not be mashed in the mails, and that each kind will be separate. Every one who receives our pamphlet can send "puff balls" if they want to, for they grow everwhere and now is the season to collect them.

NOTICE.—Our readers will note that we begin a new method in this issue and send our illustrations as separate plates. The expensive portion of these publications is the cost of the illustrations. We wish to put them in such systematic shape that we will not have to re-issue the illustrations every time we want to review the plant, and we shall therefore issue our future illustrations in the form of consecutively numbered plates.

MYCOLOGICAL NOTES.

BY G. G. LLOYD.

No. 11.

CINCINNATI, O. DECEMBER 1902.

191—BOLETUS BETULA and B. RUSSELLI.

By Prof. W. G. Farlow.

With regard to the identity of Boletus Betula Schw. and B. Russelli Frost suggested in Mycological Notes, No. 10, the following note may be of interest. The two species, although resembling one another in habit, can easily be distinguished by the spores, not to mention other peculiarities. The spores of *B. Russelli* are characterized by having on their surface a series of lines which pass nearly longitudinally, that is in the direction of the longer axis of the spores. On the other hand, the surface of spores of B. Betula are characterized by numerous papillae which are scattered and do not form lines and of which the diameter is greater than the diameter of the lines in B. Russelli. The last named species extends from Northern New England to Eustis, Fla., where it was collected by Prof. Thaxter. I have myself collected it in New Hampshire, Massachusetts and Rhode Island. B. Betula has not yet been found in New England I believe, but it is not uncommon in North Carolina where it was collected by Curtis and it was also collected by Prof. Thaxter in Tennessee.

192—ACKNOWLEDGMENT OF SPECIMENS RECEIVED SINCE LAST REPORT.

We desire to again thank each contributor who has kindly sent us specimens aiding us to gain a knowledge of the Gastromycetes.

It will be noted that we are unable to name a great many specimens of Lycoperdon that we have received. We feel that very little is known about this genus in this country, and with the exception of a few strongly marked species such as gemmatum, pyriforme, subincarnatum and cruciatum, we can not name them. We feel now that enough material has accumulated in our museum so that the genus can be worked out, and we shall devote the winter to this work. Another season we hope to have definite ideas on the subject. We shall send the specimens to Patouillard, Bresadola, Hollos, Morgan, Peck, and others who have worked with the Gastromycetes and thus find out the different views that are held regarding them. At present there seems to be no uniformity, particularly in this country. The species that we have always taken for coloratum, one mycologist takes for caepeforme and another takes for pusillum. We hope to bring about an agreement of these conflicting views and to reach definite conclusions. It is impossible to do anything with the "literature" on the subject.

We have the same trouble with the genus Tylostoma.

S. M. BAIN, TENN. Lycoperdon gemmatum.—C. H. BAKER, FLA. Scleroderma Geaster, S. vulgare, Lycoperdon cruciatum, L. velatum, (?) L. hirtum, L. (several species), Geaster delicatus, G. velutinus, G. arenarius, G. hygrometricus, G. minimus, G. Drummondii, Fomes Curtisii, Polysaccum crassipes, P. pisocarpium, P. tuberosum.—C. H. BAKER, PA. Lycoperdon cruciatum, L. (3 species), Calvatia cyathiformis, C. craniiformis, Polystictus cinnabarinus.—MISS DOROTHY A. BALDWIN, ME. Lycoperdon gemmatum, L. (sp.)—D. D. BALDWIN, HAWAII. Phallus aurantiacus?—REV. J. M. BATES, NEBR. Catastoma circumscissum, C. subterraneum, Lycoperdon cruciatum, L. (2 species), Simblum rubescens, Tylostoma (several species), Calvatia fragilis.—WM. C. BATES, MASS. Lycoperdon pyriforme.—EDITH BELL, NORWOOD, O. Calvatia rubroflava.—A. S. BERTOLET, ILL. Geaster saccatus, Calvatia craniiformis, Lycoperdon gemmatum, L. (several species), Tylostoma.—A. S. BERTOLET, ALA. Calvatia rubroflava, Lycoperdon gemmatum, L. cruciatum, Bovistella Ohiensis, Rhizopogon rubescens, Hydnangium reticulatum.—CHAS. E. BESSEY, PIKE'S PEAK, COLO. Calvatia fragilis, Bovista plumbea, var. ovalis, Geaster hygrometricus, Lycoperdon (several species).—MARIO BEZZI, ITALY. Scleroderma verrucosum, Geaster hygrometricus, Lycoperdon pusillum, L. (2 species), Cyathus (close to stercoreus), Tylostoma mammosus.—H. A. BIRD, N. J. Lycoperdon gemmatum, L. cruciatum, Scleroderma verrucosum, Cyathus stercoreus, Calvatia cyathiformis.—MRS. E. B. BLACKFORD, MASS. Mitremyces cinnabarinus.—W. C. BLASDALE, CAL. Geaster (new species to me).—E. E. BOGUE, MICH. Geaster triplex.—F. J. BRAENDLE, WASHINGTON, D. C. Tylostoma fimbriatum, Lycoperdon (several species), L. gemmatum, L. pyriforme, L. furfuraceum, ? Calvatia rubroflava, C. cyathiformis, C. craniiformis, Cyathus stercoreus, Myxomycetes, Lenzites betulina, Polyporus distortus, Lentinus ursinus, Xylaria, Bovistella Ohiensis, Scleroderma vulgare, Catastoma circumscissum, Clitocybe odora, Volvaria (sp.), Coprinus radicans, Trametes (sp.)—C. E. BROWN, WISC. Geaster Schmidelii, G. rufescens, Lycoperdon pulcherrimum, L. pusillum, L. coloratum, Bovista plumbea, Tylostoma (species), Scleroderma verrucosum, S. bovista, Cyathus striatus.—R. E. BUCHANAN, IOWA. Lycoperdon gemmatum, L. pyriforme, L. glabellum, L. Curtisii, L. (species), Calvatia hiemale?, Cyathus striatus, Scleroderma verrucosum, S. bovista, S. vulgare.—CAROLINE A. BURGIN, PA. Geaster minimus, G. saccatus, G. hygrometricus, Lycoperdon pyriforme, L. pulcherrimum, L. hirtum, L. gemmatum. Merulius tremellosus. — HENRY M. CALDWELL, TENN. Cantharellus floccosus.—J. H. CAMERON, CANADA. Lycoperdon (species), L. pyriforme, Lycogala epidendrum, Geaster triplex.—MRS. GEO. M. DALLAS, N. J. Lycoperdon (species), L. cruciatum, L. gemmatum, L. glabellum, L. pyriforme Crucibulum vulgare.—SIMON DAVIS, MASS. Scleroderma bovista, S. verrucosum, S. vulgare, var. verrucosum, Bovista plumbea, Geaster hygrometricus, Lycoperdon pyriforme, L. cruciatum, L. Curtisii, L. (several species), Calvatia cyathiformis.—C. W. DAWSON, OHIO. Cyathus

stercoreus, Lycoperdon (several species), L. cruciatum, L. Curtisii, Calvatia cyathiformis, Tylostoma (species), Bulgaria inquinans.—WALTER DEANE, MASS. Lycogala epidendrum.—C. H. DEMETRIO, MO. Lycoperdon gemmatum, L. Curtisii, L. (2 species), L. cruciatum, Trametes pini, Catastoma circumscissum, Geaster mammosus, G. (new to me), G. Morganii, G. saccatus. Cordyceps militans, Pterula, Bovistella (new species?), Calvatia rubro-flava.—T. R. DONELLY, CANADA, Mycenastrum spinulosum, Lycoperdon pusillum, L. pyriforme Calvatia (new species?).—EDW. M. EHRHORN, B. C. Scleroderma vulgare.—E. P. ELY, MINN. Geaster triplex, G. saccatus, Lycoperdon (2 species), L. pyriforme, Scleroderma, Bovista plumbea, B. pila, Lycogala epidendrum.—WM. FAWCETT, JAMAICA. Calvatia cyathiformis, Scleroderma vulgare.—Dr. O. E. FISCHER, MICH. Lycoperdon gemmatum, L. (species).—H. GARMAN, KY. Lycoperdon pyriforme.—Dr. GILLOT, FRANCE. Scleroderma vulgare bearing a plant of Boletus parasiticus.—N. M. GLATFELTER, MO. Geaster velutinus, G. triplex, G. lageniformis? G. saccatus, G. Morganii, Lycoperdon pusillum, ? L. hirtum, L. (several species), L. coloratum, L. molle. L. gemmatum, Scleroderma vulgare, S. verrucosum. S. bovista, Calvatia fragilis, C. rubroflava, C. craniiformis, Phallus (egg), Bovistella Ohiensis, Lycogala epidendrum.—ALEX. G. HAMILTON, NEW SOUTH WALES. Mylitta australis "native bread" of Australia.—W. HARRIS, JAMAICA. Cyathus (species unknown to me.—G. U. HAY, CANADA. Lycogala epidendrum, Onygena equina Lycoperdon (species).—P. HENNINGS, GERMANY. Fomes hemileucus (authentic specimens from various portions of the world, of Cooke's and Berkeley's determinations).—Dr. WM. HERBST, Pa. Geaster minimus.—ROBERT HERBSTREIT, O. Polyporus Pilotae, Calvatia craniiformis.—A. J. HILL, B. C. Lycoperdon gemmatum, L. perlatum, L. pratensis, ?. Bovista pila, Chlorosplenium aeruginosum.—WM. HOLDEN, CINCINNATI, O. Boletus collinitus, Psalliota arvense, Stropharia velutina, Geaster saccatus G. minimus, Lycoperdon cruciatum, Phallus Ravenelii.—Rev. T. C. HORTON, TEXAS. Bovistella Ohiensis.—A. HOWARD, BARBADOES. Cyathus (species unknown to me), Lycoperdon (species unknown to me).—H. H. HUME, FLA. Scleroderma verrucosum, S. bovista, Geaster hygrometricus G. saccatus var major,? Lycoperdon (two species).—OTTO JAAP, GERMANY. Mutinus caninus, Globaria furfuracea, Sphaerobolus carpobolus, Cyathus vernicosus, Lycoperdon (two species), Bovista plumbea, Scleroderma vulgare.—DAVID L. JAMES, MICH. Scleroderma verrucosum, Tylostoma fibrillosum.—CHAS. W. JENKS, MASS. Scleroderma verrucosum, S. vulgare, S. vulgare var. verrucosum, Lycoperdon cruciatum, L. Curtisii, L. (species).—P. BEVERIDGE KENNEDY, NEV. Calvatia craniiformis?.—WM. KRUEGER, GERMANY. Lycoperdon (three species), Rhizopogon rubescens, R. luteolus, Crucibulum vulgare.—PROF. LAGARDE, FRANCE. Lycoperdon gemmatum, L. echinatum.—J. G. LAMISON, OHIO. Merulius incarnatus, Lycogala epidendrum. Xylaria, Tylostoma (species). Dr. LINDAHL, OHIO. Calvatia Bovista, 42½ in. circum., 7½ lbs.

weight.—R. B. MACKINTOSH, MASS. Geaster Schmidelii, G. Morganii, G. hygrometricus, G. pectinatus, Lycoperdon gemmatum, L. (several species), L. Curtisii, L. pyriforme, var tesselatum, L. pyriforme, Calvatia elata C. cyathiformis, Scleroderma vulgare var verrucosum.—PROF. JOHN MACOUN, CANADA. Geaster triplex, G. velutinus, G. minimus, Bovista plumbea, Lycoperdon (3 species) L. caepeforme?, L. pusillum, L. pedicellatum, L. Custisii, L. coloratum, L. gemmatum L. pyriforme, Crucibulum vulgare, Secotium acuminatum, Calvatia cyathiformis—DR. P. MAGNUS, GERMANY. Lycoperdon pyriforme.—M. MARTINEZ, MEXICO. Geaster Drummondii.—CHAS. McILVAINE, MD. Lycoperdon (species), Tylostoma fimbriatum?, Catastoma circumscissum.—T. L. MEAD, FLA. Geaster delicatus, G. hygrometricus, G. triplex, G. velutinus, G. Drummondii, G. saccatus, Cyathus (species new to me), Myriostoma coliformis, Tylostoma (3 species), Lycoperdon cruciatum, L. pusillum, L. (several species), Scleroderma vulgare, S. verrucosum, Scleroderma Geaster, Catastoma pedicellatum.—S. G. MILNER, MICH. Polyporus Schweinitzii P. adustus, P. biformis, P. versicolor, Trametes Peckii, Merulius tremellosus, Pleurotus nidulans, Polystictus hirsutus, P. pergamens, Panus rudis, Favolus Europaeus, Lenzites betulina.—C. E. MONTGOMERY, N. H. Geaster Schmidelii.—WM. L. MOORE, TEXAS. Calvatia cyathiformis, C. craniiformis, a curious Gastromycetes, very different from anything I know, but so immature that I can not even make out its genus.—TOJI NISHIDA, JAPAN. Lycoperdon (three species), Scleroderma verrucosum.—MRS. M. A. NOBLE, FLA. Geaster hygrometricus, G. triplex, G. saccatus, Polysaccum pisocarpium, Myriostoma coliformis, Polyporus, Lycoperdon (species), L. cruciatum, Scleroderma Geaster, Polystictus parvulus, P. cinnamoneous, P. sanguineus, Lenzites saepiaria, Scleroderma vulgare, Peziza (species).—H. PAGE, MASS. Bovista plumbea. B. minor?, Lycoperdon (two species), L. glabellum, L. gemmatum var. hirtum, L. atropurpureum, L. subincarnatum, L. caepeforme, L. furfuraceum, Lycogala flavofuscum, Scleroderma bovista.—N. PATOUILLARD, FRANCE. Calvatia saccata.—FLORA W. PATTERSON, WASHINGTON, D. C. Cyathus stercoreus.—CHAS. H. PECK, N. Y. Lycoperdon muscorum.—MRS. M. S. PERCIVAL, TENN. Lycoperdon pusillum, L. (three species), L. pyriforme, L. gemmatum, L. cruciatum, Bovistella Ohiensis, Scleroderma vulgare, S. verrucosum, Calvatia cyathiformis, Polyporus (unknown to me), Rhizopogon rubescens.—C. V. PIPER, WASH. Polyporus (unknown to me.)—E. S. PRINCE, MINN. Trametes confragosa, Thelephora anthocephala Polystictus conchifer, P. hirsutus Geaster saccatus, G. triplex, Polyporus picipes.—F. M. READER, AUSTRALIA. Tylostoma (close to mammosus), Fuligo, Lycoperdon (four species).—F. L. STEVENS, N. C. Hydnum subsquamosum.—ROLLIN H. STEVENS, COLO. Catastoma circumscissum, Tylostoma (species), Secotium acuminatum.—J. G. O. TEPPER, AUSTRALIA. Tylostoma (species). Geaster (species), Scleroderma (species).—ROLAND THAXTER, FLA. Cauloglossum transversarium.—H. L. TRUE, OHIO. Bovistella Ohiensis, Lycoperdon (species), Secotium acumi-

natum, Marasmius Oreades.—SUSAN TUCKER, WASH. Bovista plumbea.—F. J. TYLER, VA. Mitremyces Berkeleyii?.—MRS. A. R. WARNER, N. H. Bovista pila.—H. E. WARNER, MASS. Lycoperdon (species), Geaster hygrometricus, Bovista plumbea, Thelephora, Scleroderma verrucosum, S. Geaster.—L. H. WATSON, ILL. Geaster hygrometricus, Lycoperdon caepeforme, L. pulcherrimum, L. pyriforme, L. (several species), Lycogala epidendrum.—G. W. WEBSTER, FLA. Lycoperdon cruciatum, L. (species).—L. E. WELD, MICH. Lycoperdon (three species). L. pedicellatum, L. gemmatum, L. Curtisii?, Scleroderma verrucosum, S. bovista, Secotium acuminatum?, Calvatia cyathiformis, Bovista pila.—MARY S. WHETSTONE, MINN. Scleroderma vulgare, Lycoperdon pulcherrimum, L. (species), Geaster saccatus, G. limbatus, G. triplex, Calvatia cyathiformis.—HOLLOS WEBSTER, N. H. Lycoperdon gemmatum, L. (species)—WISCONSIN MYC. CLUB, WISC. Lycoperdon elongatum, L. cruciatum, L. gemmatum, L. caepeforme?, L. pyriforme, L. (species), Lycogala epidendrum, Geaster Schmidelii, G. rufescens, Bovista plumbea, Scleroderma vulgare.—F. K. VREELAND, ME. Lycoperdon muscorum, L. (several species), L. pyriforme, Bovista pila.—L. G. YATES, CAL. Battarea Digueti, Scleroderma? (new to me, surely none of the common species. It looks like Polysaccum crassipes but peridioles seem fragile).—T. YOSHINAGA, KOCHI, JAPAN. Scleroderma verrucosum Geaster hygrometricus Cyathus stercoreus? (This plant differs slightly from stercoreus, but has similar large globose sporidia. It is very close to it if not a form).

193—NOTES ON A REVIEW OF THE "GEASTRÆ."

"Lloyd takes every occasion to insist on the futility of publishing authorities as being an unnecessary pandering to the vanity of species makers."—*British Journal of Botany.*

That is a correct statement of the case and we have not changed our opinion.

"Lloyd assumes that his determinations and descriptions are absolutely final and it is unnecessary for the student to look further. —*British Journal of Botany.*

There is no such statement in the pamphlet or in print. I am very sorry if I have given any individual such an impression for the statement is certainly far from the fact. On the contrary, no one realizes more than I do that our views of the species are dependent upon the light before us and the information prevalent at the time of publication and also that these views are subject to modification as we subsequently learn more of the subject. In evidence I quote from Mycological Notes, page 93:

"No rule can be laid down to define a species. It is simply a matter of individual opinion, of individual conviction. Two plants that impress one person as entirely distinct, may appeal to another person as being only forms of the same plant and vice versa. There can be no authority in such matters, we can only defer to the opinions of those who have the largest experience, and I believe the more experience one has the more liberal one becomes."

Since the pamphlet appeared my views have changed in reference to two or three species. I now know that Geaster "saccatus" is not distinguished by having a globose, unexpanded form as we stated at the time the pamphlet was issued. I believe that G. fimbriatus and G. saccatus are practically the same plant. I am becoming more strongly convinced every day that Bresadola is right and G. Morganii is at the best but a sulcate mouthed form of G. lageniformis.

"With the exception of G. Berkeleyi Massee and G. Michelianus Smith. the British species have all been found in America."—*British Journal of Botany.*

This I have never stated but on the contrary, my views as expressed are that G. Berkeleyi is a synonym for G. asper and that it is found in America.

194—CUI BONO.

Botanical writers who insist on giving personal authorities after the names of plants involve themselves in many curious errors. Especially is this so when they try to apply the rules of priority without knowing all the facts. Let us cite an instance. Hudson, an English botanist, called the large, fornicate species of Geaster, which is the only one we have any evidence of occuring in England, Lycoperdon fornicatum. Fries met the little pine-loving species that grows so common in Sweden, and supposing it to be Hudson's plant, called it by his specific name, Geaster fornicatus. In addition to making this mistake, he drew his description mostly from an inaccurate cut and described it as having a sulcate mouth, a feature possessed by no known fornicate species of Europe. Fries is probably excusable in not knowing that his species was not the same as Hudson's, but there is no excuse in these modern days, after the matter has all been written up and explained for any person to use such a mongrel citation as "Geaster fornicatus (Hudson) Fries." The names are the same, by reason of errors in the past, but the plants are entirely different. Still some modern authors do not seem to care anything about such facts as these. In their strife for names in keeping with their ideas of priority, it matters little it seems whether the plants are the same or not as long as the *name* is the same. But as Lycoperdon fornicatum of Hudson is one plant, and Geaster fornicatus of Fries, is another, will somebody tell us what "Geaster fornicatus (Hudson) Fries" is?

195—HYPOCREA ALUTACEA.

By Prof. W. G. Farlow.

Hypocrea alutacea was collected by me at Shelburne, N. H., in September 1891. It grew in very small quantity under *Pinus Strobus* where was also growing abundantly *Clavaria Ligula*. Those interested in the determination of this plant should consult Cornu, Note seu l' Hypocrea alutacea in Bull. Soc. Bot. France, XXVI, 33, 1879. I have never found the species except in the case just mentioned, and, although the presence of *Clavaria Ligula* has been noted by others in connection with the Hypocrea, I was not able to trace any direct connection between the two.

196—GEASTER SACCATUS, form MAJOR.

The accompanying figure was issued in our Geastrae pamphlet as an illustration of Geaster lageniformis. At that time we had Bresadola's authority for so referring it, and supposed that Geaster lageniformis differed from Geaster saccatus in the acute shape of the undeveloped plant. Our observation in the woods this summer has convinced us that Geaster saccatus has an acute undeveloped shape, (see Mycological Notes, page 104) and hence find it difficult to present

Fig. 60.
Geaster saccatus, form major.

any characters to distinguish our common little Geaster saccatus from the plant that we illustrated as Geaster lageniformis. We have taken the matter up again by correspondence with Bresadola, and he has reached the conclusion (with which we fully concur) that they are forms of the same plant and should be named Geaster saccatus form major, and Geaster saccatus form minor. "The specimens you send are all forms of Geaster saccatus. Geaster lageniformis, Vittadini, according to the European specimens is a little different, and is known by the spores 4–5 mic. in diameter and *clavate columella*, while in your specimens the spores are 3–3½ mic. and the columella *clavate capitate.*" We do not have in our collection any European material of Geaster lageniformis, and in my opinion that species does not occur in this country.

197—GYROPHRAGMIUM DELILEI from SARDINIA.

A letter from Mr. Cavara calls our attention to the fact that we stated that the Gyrophragmium Delilei, which he sent us was collected in Sicily. Such is not the case; the specimen having come from Sardinia. The plant is, however, as we stated identical with our western plant.

198—STIPITATE AND SESSILE GEASTERS.

With the development of our knowledge of the Geasters some things that were obscure to us at first are readily comprehended. At the time we wrote the pamphlet we could not understand why Geaster rufescens was always included in the "sessile section", while the museum specimens are more or less stipitate. We have received fresh specimens from Mr. Caldwell of Rugby, Tenn. that clearly explain the apparent discrepancy. When the plants are fresh the inner peridia are sessile, but as they dry the fleshy layer draws away from the inner peridium leaving it more or less stipitate.

Fig. 61.
Geaster minimus.
(Young.)

Fig. 62.
Geaster minimus.
(Fresh.)

Fig. 63.
Geaster minimus.
(Dry.)

Mr. Holden of this city recently brought us a fine lot of little Geasters that we did not at first recognize. They were sessile, as shown in the accompaning cut. We laid the plants to one side and when they were dried they were discovered to be the typical Geaster minimus, just as we have always known them from our dried specimens. Geaster minimus is therefore a "sessile species" when fresh, though it is decidedly pedicellate when dry.

199—LYCOPERDON CRUCIATUM=L. MARGINATUM.

We contended (see Mycological Notes, p. 83), that Dr. Hollos was wrong in referring L. cruciatum to L. marginatum as the latter is described as having purple spores. Prof. Patouillard writes us that he has studied the original specimen of Vittadini of marginatum and that it is cruciatum as Dr. Hollos claims. This exemplifies one of the beauties of "priority" investigations. Formerly we called the plant L. separans the name known in this country, and then we became convinced and succeeded in convincing Prof. Peck that it was L. cruciatum of Europe as Berkeley had always called it. Now we have an authoritative statement that it is marginatum of Vittadini. There is no telling when another old-new name may turn up and awaiting its advent we shall continue to call it L. cruciatum. Had Vittadini described the color of the spores as correctly as he depicted the plant, we would however be willing to make another change and call it by the name he gave it.

MYCOLOGICAL NOTES.

BY C. G. LLOYD.

No. 12.

CINCINNATI, O. DECEMBER 1902.

200.—THE BOVISTAE.

We have classed the Bovistae as a subtribe of the Lycoperdeae (see Genera of Gastromycetes, p. 11). They are the "tumblers" of the puff ball world. They differ essentially from the true Lycoperdae in their habits (see Myc. Notes, p. 85). When ripe they break away from the place of growth and disperse their spores by a method entirely different from that of the Lycoperdae. Nature has provided them with peridia and capillitia specially suited for this method of spore dispersion.

THE PERIDIUM.—The peridia of the genera Bovista and Mycenastrum when young consist of two layers, an outer thin layer called the cortex, and an inner firm layer that is permanent and generally referred to as "the peridium." In Catastoma the outer peridium is thick. Details regarding the nature of the peridium layers will be found under each species.

COLOR OF THE SPORE MASS.—The immature gleba is white. As it ripens it passes through various shades of olive (or even yellow) to a dark brownish purple, almost black. If a specimen be collected and dried when it begins to ripen, the gleba will retain to a large extent the color it possessed when collected, hence the color of the spore mass of various specimens as found in collections is of no value in determining the species.

STERILE BASE.—All species of Bovistae as far as we know are devoid of a sterile base. For a long time this was the main character used to define the genus.

The "Bovista" of Fries' conception was in brief a puff-ball without a sterile base. According to our present views the absence of sterile base is only one of the characters of the genus, hence in Bovista of Saccardo, Massee, Fries, we find species that we refer to Mycenastrum, Catastoma, Calvatia and even Lycoperdon.

CAPILLITIUM.—The capillitium of the Bovistae is strongly characteristic. It consists of *separate, usually branching threads*. Each thread is distinct and complete in itself and has no connection with the peridium or columella. Each genus of the Bovistae has its peculiar type of threads (see figures in the plates of various species of Bovista, Mycenastrum and Catastoma). In Bovista lateritia (see plate 4, fig. 6,) the threads are very long, slender, branched, interwoven, and it is not possible to float out "separate threads" as can readily be done with most species of the genus. (See note page 7, Gastromycetes Genera). The first impression in examining the threads in this species is that they do not belong to the Bovista type. The threads of Catastoma (see

plate 6, fig. 6) have blunt ends and appear as fragments of a continuous thread. Whether they are fragments that have broken up or are separate distinct threads we do not know. Reasoning from analogy as concerns the threads of others of the Bovista, and from the fact that we find none that are tapering we are inclined to the latter view.

CLASSIFICATION.

The Bovistae is composed of three genera, which as far as we know, are entirely distinct and do not shade into each other. The genus Bovista however, does shade into the genera Bovistella and Lyperdon of the Lycoperdae.

Capillitium of separate, much branched threads, with slender pointed branches, ... Bovista.
Capillitium of separate, entire or few branched, threads, bearing spiny points, ... Mycenastrum.
Capillitium of short, entire, smooth threads with blunt ends, . . Catastoma.

201—BOVISTA.

With a little experience the genus is recognizable on sight by reason of external appearances, the nature of the peridia and the habits of the plants. Of course there are internal features and microscopic conditions that confirm the distinction. There may be it is true, plants with the "Bovista appearance" outside that have entirely distinct internal structure, but we do not know of any. Plants are known that have the same internal structure, but are different in their habits and nature of the peridium, these we call Bovistella (*) (see Myc. Notes, p. 85).

The peridium of Bovista is firm, parchment–like, elastic, persistent. The plant breaks away from the place of growth, and persist tumbling about on the ground for months. There are two layers of the peridium in young plants, the outer very thin and called the cortex. As the plant ripens the cortex peels off in patches and entirely disappears from the perfectly ripe plant. The cortex of most species is smooth, nor does it develop spines as do most species of Lycoperdon. Bovista pila has a smooth cortex when very young. As it grows it becomes somewhat broken up in scales or granules, but it is never "pilose."

The capillitium of Bovista consists of separate threads as shown in our plates. In the mass, these threads are firm and elastic, and thus the spore mass of Bovista can be distinguished by the eye from that of other genera of "puff-balls." This is an adaptation to further the method of spore dispersion of Bovista (cfr. Myc. Notes, p. 85). The spores of most species of Bovista are pedicellate, a few are not. Lycoperdon pedicellatum is the only gastromyces I know that has truly pedicellate spores and does not belong to Bovista, or the related genus Bovistella.

(*) Systematists who attach importance entirely to structural characters will call them all Bovista. This is simply a question of opinion. I am partial to genera that present features by which I know them as soon as I see them. Acknowledging theoretically the structural importance of the distinction, I do not fancy a genus like "Ulocolla" where you have to "sprout the spores" before you can tell it.

THE SPECIES OF BOVISTA.

We have specimens representative of six species. Bovista plumbea, a small plant, common both in this country and Europe; Bovista pila, a large plant frequent in this country, not in Europe; Bovista nigrescens, a large plant from Europe which does not grow with us. Of the rare species we have Bovista minor from Ohio; B. tomentosa from Italy, and B. lateritia from Mexico. Bovista pila and lateritia have spores with none, or very short pedicels; the remainder have long-pedicellate spores.

202—BOVISTA PLUMBEA.

(Plate 1.)

Usually globose, or depressed globose, from two to three cm. in diameter. Old specimens from which the cortex has disappeared are somewhat lead color, hence the name. The cortex of a young growing plant is smooth and white. The surface sometimes breaks up into little white granules as it dries; finally the cortex loosens and shells off entirely from the peridium. The peridium is of a lead color, smooth, firm, parchment-like. It opens by a small definite mouth. Spore mass compact, elastic, olivaceous if the specimen is dried before perfect ripening, but when normally ripened dark purplish-brown. Capillitium threads much branched, with slender tapering branches. Spores sub-globose or ovate, smooth, even, 5–6 mc. with long pedicels (10–12 mc.)

Bovista plumbea is a frequent plant in Europe and Northern sections of this country, growing usually in old pastures. It is readily distinguished from our other common species of Bovista (B. pila) by its color, small size, and pedicellate spores.

Specimens in our Collection.

Maine, H. C. Beardslee. *Massachusetts*, Simon Davis, G. E. Morris, H. Page, H. E. Warner. *New Hampshire*, C. E. Montgomery, (†) Hollis Webster, (†). *Michigan*, (very common) C. G. Lloyd. *Minnesota*, E. P. Ely, (†) Minn. Bot. Survey, Dr. N. M. Cook. *Illinois*, (near Chicago) H. L. Watson, W. S Moffatt. *Wisconsin*, C. E. Brown, Wisc. Myc. Club. *Iowa*, W. J. Teeters, T. H. Macbride. *Colorado*, E. Bethel, (†) (Pike's Peak) Chas. E. Bessey, (†). *Oregon*, David Griffith. *Washington*, W. N. Suksdorf, Susan Tucker, C. V. Piper. *California*, L. A. Greata, A. J. McClatchie (labeled ammophila). *Ohio*, (Cincinnati) A. P. Morgan (†). (Rare here, I have never found it.—C. G. L.)

Canada, J. M. Macoun. *France*, N. Patouillard. *Germany*, P. Magnus, Otto Jaap.

From the above it will be noted that Bovista plumbea is of a northern range extending across the continent. Los Angeles, Cal. and Cincinnati are the only stations at all Southern. The specimens from C. V. Piper, Washington, are larger and blacker than usual and at first we were disposed to refer them to B. nigrescens, from which however, they differ as to spores.

203—BOVISTA PLUMBEA. (Oval Spored Form.)

(Plate 1, Fig. 8.)

Morgan describes the spores as oval and states that he has never seen specimens with globose spores. A close examination of the 45 different collections in our Museum shows that most spores are not truly globose but have a tendency to oval form. There is, however, a wide range in this respect, as shown in our microphotograph (plate 1, figures 7 and 8). In only a very few is the shape de-

cidedly oval and those are marked with a † in our list of specimens. Morgan suggests that it is B. ovalispora of Massee. We think it is rather B. fulva of the same author (described from immature specimens) and that B. ovalispora bears the same relations to B. nigrescens that "B. fulva" does to B. plumbea.

204—BOVISTA PILA.

(Plate 2.)

Usually globose, or somewhat plicate at the base, from four to eight cm. in diameter. Old specimens from which the cortex has disappeared are black or bronzed color. The cortex is early broken into granules which finally disappear, leaving the peridium smooth and shiny. The peridium opens by an irregular torn aperture. Spore mass firm, compact, at first olivaceous, finally dark purplish brown. Capillitium threads much branched, with short, thick, rigid, tapering branches. Spores globose, even, 4–5 mc. in diameter, usually without a pedicel, sometimes with a very short one.

Bovista pila is the only large species in this country. In size and general appearance it closely resembles B. nigrescens of Europe and the early mycologists (Schweinitz, Curtis and Berkeley at first) took it for nigrescens. When Berkeley worked over the American Bovistas for Grevillea (1873) he no doubt noticed the discrepancy in the spores and having a young specimen from Wisconsin he inaccurately described it as being "finely tomentose." If he recognized as the same plant the specimen he had previously called B. nigrescens for Lea he made no mention of the fact. When Ellis worked with the plant he evidently noted that it had the same capillitium threads as Bovistella Ohiensis. Cooke had written Ellis that they were the threads of Mycenastrum (Cooke's idea of Mycenastrum threads was certainly vague at that time). Ellis therefore first called it Mycenastrum Oregonense and published it under that name. Afterwards Cooke wrote Ellis that the species was Berkeley's Bovista pila. Morgan who was in close touch with Ellis thus published it, and since Morgan's work appeared, the plant has been generally known in this country under this name. If Berkeley had purposely exerted his utmost ingenuity, he could not have selected a more inappropriate name. The plant is *never* "*pilose*" and when perfectly ripe is the smoothest of the smooth species.

Specimens in our Collection.

Canada, A. J. Hill. *Maine*, (obovate form, see plate 2, fig. 5) F. K. Vreeland, P. L. Ricker. *New Hampshire*, Mrs. A. R. Warner. *Massachusetts*, Simon Davis, L. Leroy Sargent. *New York*, C. L. Wakeman. *Pennsylvania*, Dr. Wm. Herbst. *West Virginia*, Dr. J. Gilbert Selby, C. G. Lloyd. *Ohio*, C. G. Lloyd. *Minnesota*, E. P. Ely, Dr. N. M. Cook. *Michigan*, W. H. Aiken (see plate 2, fig. 4), Mrs. Eugene Wright, L. E. Weld, C. G. Lloyd. *Iowa*, T. J. Fitzpatrick, W. J. Teeters, T. J. Macbride. *Colorado*, E. Bethel. *Washington*, W. N. Suksdorf. *North Carolina*, A. G. Wetherby.

It will thus be noticed that the plant is principally of a northern range and extends from coast to coast. Michigan supplies us specimens in the greatest abundance. The only Southern station we know is North Carolina.

The plant does not grow in Europe.

SYNONYMS.

Bovista Montana. We have examined authentic specimens of this plant which was described as having a thinner peridium and more slender threads than Bovista pila, and are unable to distinguish any difference.

We have also seen authentic Bovista tabacina (Lanopila tabacina in Sac. Syl.) and it is a bronzed form, or rather a bronzed condition. Specimens that have wintered in the open take on a bronzed color like the throat of a turkey gobbler and are frequent both in Ellis's and our own collection.

Occasionally we meet with specimens not globose but obovate in shape as figured plate 2, figs. 4 and 5. Such specimens we think are what Massee has called Bovista obovata. De Toni (in Sac. Sylloge) has compiled Ellis's "Mycenastrum Oregonense" as Scleroderma Oregonense.

205—BOVISTA NIGRESCENS.

(Plate 3.)

Usually globose, from four to six cm. in diameter. Old specimens from which the cortex has disappeared are black or dark brown, smooth and shining. Cortex a thin, smooth, white layer which peels away entirely. Peridium dehiscing by a large torn aperture. Spore-mass umber brown with a purple tinge. Threads branched, with slender tapering branches. Spores globose, smooth, 5–6 mc. with a short pedicel 5–6 mc.

Bovista nigrescens is the large species of Europe. It is said to grow in "dry pastures and heathy places." The general appearance is the same as B. pila of this country, but it can be distinguished at once by its spores. It does not grow in our country notwithstanding the numerous records.

Specimens in our Collection.

England, Chas. Crossland (a fine lot). *France*, N. Patouillard. *Tirol*, Rev. G. Bresadola. *Belgium*, C. Van Bambeke.

SYNONYMS.

The plant has been called in various writings Lycoperdon nigrescens, Globaria nigrescens, Lycoperdon globosum, Lycoperdon Bovista. The latter name is applied by Sowerby to his illustration t. 331, which is evidently this plant. Sowerby however, confuses in his text Bovista plumbea, Bovista nigrescens and Calvatia Bovista under the Linnaean name for the last species.

206—BOVISTA MINOR.

(Plate 3.)

Sub-globose, about 1½ cm. in diameter. Cortex thick, attached to the soil by universal mycelium, and falling away at maturity, excepting a small portion at the base. Inner peridium thin, subflaccid, opening by a small aperture. Spore mass brown. Capillitum threads branched, with long slender branches. Spores 4 mc. globose, smooth, with long (15 mc.) pedicels.

This plant is peculiar in its habits. Buried in the ground, the cortex peels off adhering to the soil as the plant comes to the surface. A portion of the cortex remains at the very base and in general appearance it resembles a Catastoma. Hollos claims that it is the same as Bovista tomentosa, but it seems to me to differ widely as to habits. Its capillitium threads are quite different. Its spores are smaller and have longer pedicels.

Specimens in our Collection.

Type specimen from A. P. Morgan. It has never reached me otherwise save some very young specimens which I doubtfully refer to this plant, sent by H. Page, Massachusetts.

207—BOVISTA TOMENTOSA.

(Plate 4.)

My knowledge of this plant is confined to a single pressed specimen received from Bresadola. This specimen is about the size of plumbea, but has a dull surface. Capillitium threads as shown are relatively short and thick. Spores much smaller than plumbea, 4–5 mc. with pedicels 8–10 mc. long.

Specimens in our Collection.

Tirol, Rev. G. Bresadola.

SYNONYMS AND HISTORY.

It was described by Vittadini as Lycoperdon tomentosum and is badly named for it is really not "tomentose." It has been called also Globaria tomentosa. It occurs in the warmer portion of Europe.

208--BOVISTA LATERITIA.

(Plate 4.)

When Massee (1888) worked up the Bovistas he found in Berkeley's herbarium a specimen labeled "Bovista lateritia" sent by Montagne. Locality not known. We have received from Prof. T. H. Macbride a half specimen so labeled, collected by Sanderson in Mexico. It seems to us to answer the description. The cortex is gone, and the peridium which is very thin, is brick red, (the name means brick color.) Spore mass compact, rust-color. Capillitium of long slender branching threads, at first sight seeming to be of the Lycoperdon type. They are however, separate threads, but so long, slender, and interwoven that they cannot be floated out singly as can the threads of most species of Bovista. Spores globose, warted, 5–7 mc.

209—BOVISTA ASPERA.

(Plate 4.)

We have received from W. Jekyll, Jamaica, little specimens which Prof. Patouillard refers to Bovista aspera.

In Saccardo this plant is given as a Lycoperdon on authority of Spegazzini (where? *not* Fungi Guaranitica) but evidently referring to some other plant as spore description does not agree at all. Our specimens are true Bovistas, though the cortex has little spiny nodules as a Lycoperdon. There is no sterile base. Capillitium of separate threads with slender branches. Spores globose, smooth, 5 mc. with pedicels 10 mc. long. Several species in our collection appear to dehisce by several mouths (see plate 4, fig. 8) but whether this is normal or due to work of insects we do not know.

Specimens in our Collection.

Jamaica, W. Jekyll.

210—MYCENASTRUM.

The genus is characterized by the spiny capillitium (see plate 5, fig. 8). Even in very immature plants these peculiar threads can be distinguished. We have never seen them so excessively spiny as shown by the figure in Engler and Prantl. Morgan's drawing does not well represent them.

Many species of Mycenastrum have been described which Dr. Hollos claims to be all forms of the same plant, and that it is cosmopolitan. These are mostly included in Saccardo as Sclerodermas, but the genus is widely different from Scleroderma. The original species came from France and was called Lycoperdon Corium. In this country the species is usually known as Mycenastrum spinulosum, but I do not think it presents any characters by which it can be distinguished from the European plant. (Our previous note on the subject, Myc. Notes, p. 79, to the contrary notwithstanding).

211—MYCENASTRUM CORIUM.

(Plate 5.)

If we accept Hollos' references of all species of Mycenastrum to this one species, the plant grows in every continent in the world. In the United States, its home is the plains of the Western States, and it occurs in abundance in Colorado, Kansas, Iowa, as far south as Texas, west to the coast (Southern California), Washington, The furthest east that we have specimens is near Chicago.

As found in this country the plant is usually globose or depressed globose, but specimens from Texas (plate 5, figures 4 and 5) and from Hungary (plate 5, fig. 6) are obovate in shape. The peridium is thick, hard, almost woody. It varies in thickness from one to four millimeters. When young the cortex is smooth, or with a felty appearance (see plate 5, fig. 2). It dries up and disappears when the plant ripens, leaving the peridium smooth. The plant dehisces by the peridium splitting into a number of stellate lobes, but usually the plant breaks away from its base, and is rolled about unopened for months. In ripening the gleba first turns bright olive (almost yellow). Finally it becomes dark purplish brown. The peculiar capillitium threads are the generic character. They are simple, or few branched, short, thick, pointed at the ends, and *bearing little spiny prickles*. The spores are globose, large, 8–10 mc., warted. (*)

In Myc. Notes, p. 79, we drew attention to the fact that the American plant has columella strands (see plate 5, fig. 3). In no other country has a columella ever been noted in a Mycenastrum. If it were a constant character of our plant we should say it was of specific importance, but an examination of many specimens shows that while present in some specimens, in others there is no trace of it and there is no other difference between them. It is simply a fact that some plants possess columellæ and others do not. This columella is of the nature of undeliquescing gleba, though the hyphæ while of a

(*) Morgan states they "often have a minute or slender hyaline pedicel" We have never seen them, though an examination of immature gleba demonstrates they are borne on the basidia on short pedicels.

similar nature to the capillitium are larger, thicker, more branched, and the spores in the tissue are very few.

SYNONYMS.

The plant was first described as Lycoperdon Corium. It has undoubtedly been redescribed under a number of names. Hollos states that twelve of the "Sclerodermas" in Saccardo belong here. In this country the plant has been mostly known as Mycenastrum spinulosum.

Specimens in our Collection.

Illinois, (near Chicago) Dr. L. H. Watson, (near Havana) H. C. Beardslee. *Minnesota*, Minn. Bot. Survey. *Iowa*, W. J. Teeters, T. H. Macbride. *Kansas*, E. Bartholomew. *Colorado*, E. B. Sterling, (In great abundance). *Nevada*, David Griffith. *Texas*, E. P. Ely, T. C. Horton. *Washington*, C. V. Piper. *California*, (Los Angeles) L. A. Greata. *Canada*, T. R. Donnelly.

Hungary, Dr. L. Hollos.

212--MYCENASTRUM CORIUM form STERLINGII.

(Plate 5, Figures 10 and 11.)

We have received from E. B. Sterling, Denver, Colo., and from him alone, a remarkable form which instead of being smooth as usual, has the peridium marked with large scales (see plate 5, figs. 10 and 11). When we first received young specimens of this plant, we supposed it to be the young of Calvatia sculpturatum, but the Mycenastrum capillitium showed its true nature. Since, an abundance of material sent by Mr. Sterling exhibits all grades of connecting forms between it and the ordinary smooth form, we question if it is even entitled to a distinctive name. Had specimens of the extreme form been sent to Berkeley he would probably have called it a marked "new species" and our literature would have been burdened with one more synonym.

The Genus Catastoma will appear in next issue.

213—MICRO-PHOTOGRAPHS.

Mr. Uranus Hord, an expert microscopist as well as photographer, has installed in the Lloyd library a micro-photographic apparatus. We thus have facilities for making micro-photographs as easily as we can photograph ordinary objects. For the spores of the Gastromycetes we shall adopt a uniform magnification of an even thousand. This has one strong advantage. As a micron is a millionth part of a meter, one thousand microns are equal to a millimeter. Therefore the size of the spores can be readily ascertained by a *millimeter scale, each millimeter of the micro-photograph representing a micron* of the actual size of the object. Individual observers may vary as to the size of the spores when measured by an eye piece scale, but we cannot see how there can be any error in a process of micro-photography where the instruments that magnify and photograph are always exactly the same.

MYCOLOGICAL NOTES.

BY C. G. LLOYD.

No. 13.

CINCINNATI, O. FEBRUARY 1903.

214—CATASTOMA.

The genus Catastoma until the last few years has been confused with Bovista, though it is different. The capillitium threads in Catastoma are short, thick, uniform, almost simple, (see plate 6, fig. 6) widely different from Bovista threads. The exoperidium is not a thin cortex as in Bovista but a thick layer. At maturity this layer breaks in an irregular circumscissal manner, part remains as a cup in the ground, and part remains attached as a kind of cup to the inner peridium. The inner peridium with this portion of the exoperidium still attached at the top becomes loose and is rolled over the surface of the ground. It opens by a little mouth opposite the portion to which the fragment of the exoperidium is attached, hence the mouth opens in that part of the inner peridium that is the base in the growing plant. With specimens of the loosened plant the top is naturally taken for the bottom, and we have shown them in our illustration with the *mouth up*.

We have in this country three species of Catastoma, or rather I think two, for Catastoma circumscissum and Catastoma subterraneum are small and large spored varieties I think of the same species.

KEY TO THE SPECIES.

Spores short-pedicellate., ... C. pedicellatum.
Pedicels none or minute, spores 4-5 mic.. . . . . C. circumscissum.
Pedicels none or minute, spores 6–8 mic. . . . . C. subterraneum.

215—CATASTOMA PEDICELLATUM.

(Plate 7.)

Peridium depressed globose from 1–3 cm. in diameter. Spores globose, coarsely warted, 8–9 mic. in diameter, with a pedicel 5–7 mic. long.

This is our Southern species. We only have it from Florida but Ravenel distributed it from South Carolina. The exoperidium is thinner than in the two following species and sometimes disappears entirely from the inner peridium. We have a number of specimens with the exoperidium still intact (see plate 7, fig. 6). They were no doubt gathered and dried immature.

SYNONYMS.

This plant was distributed by Ravenel (No. 15) as Bovista nigrescens. Its subtropic nature would leave us to infer that it occurs in other tropical countries, but we are unable to identify by the descriptions the names under which it has been probably called as "Bovista."

Specimens in our Collection.

Florida, Mrs. Delia Sams, Theo. L. Mead, C. G. Lloyd.

216—CATASTOMA CIRCUMSCISSUM.

(Plate 6.)

Peridium of mature plant usually depressed globose, 1–2 cm. broad, ½–1 cm. high, with the thick exoperidium remaining as a cup at the base (in reality at the top). In many specimens a spongy layer is found between the inner and outer peridia. Attention was first drawn to this fact by B. O. Longyear (see Myc. Notes, p. 78). This layer is shown on plate 6, fig. 5. Spores globose, 4–5 mic. minutely warted, often with a minute pedicel.

This plant usually grows in old pastures or yards, frequently in paths. It absorbs moisture in wet weather and swells up. When dry it becomes smaller and firmer.

As a usual thing plants are more depressed, smaller and have smaller spores than the next species. Still, we find in the Western United States large globose specimens with the same small spores, and we find little depressed specimens with large spores, so that without examining the spores the species cannot be told apart. (*)

SYNONYMS.

The plant was described as Bovista circumscissum by Berkeley. It is called Disciseda circumscissa by Hollos, but as the genus Disciseda is purely a case of "hindsight," (see Myc. Notes, p. 100) we do not accept it. An examination of Schweinitz's specimen of Bovista candida shows it also to be this species and settles what has been a "puzzle plant" for over seventy years.

Specimens in our Collection.

Vermont, Hollis Webster. *Maryland*, Chas. McIlvaine. *District of Columbia*, Fred. J. Braendle, H. E. Warner. *Ohio*, C. G. Lloyd. *Michigan*, B. O. Longyear, C. G. Lloyd. *Iowa*, T. H. Macbride. *Missouri*, C. H. Demetrio. *Colorado*, E. B. Sterling, Rollin H. Stevens (in mountains 9000 feet elevation). *Nebraska*, Rev. J. M. Bates. *Washington*, W. N. Suksdorf, C. V. Piper.

217—CATASTOMA SUBTERRANEUM.

(Plate 7.)

Peridium usually globose, sometimes depressed, from 2–4 cm. in diameter. Spores globose, 6–8 mic. minutely warted, often with a minute pedicel.

The home of this plant is the Middle West. It grows in abundance in Colorado, and Mr. Bethel informed me it is the common little "puff-ball" in waste places around Denver. It is also found in Hungary. The only constant difference between it and circumscissum is its larger spores (see remarks under circumscissum).

SYNONYMS.

Prof. Peck described it as Bovista subterranea. Hazlinsky just previously had described it from Hungary as Globaria debreceniensis. It is compiled in Saccardo as Bovista debreceniensis. We do not feel like discarding an appropriate name like subterraneum well established in this country, for such an uncouth name as "debreceniensis," even if that term has a couple of years "priority," nor do we accept Hollos' "hindsight" name "Disciseda debreceniensis."

(*) Massee states "subterranea is simply a form with a more persistent cortex, but in every other respect the two are identical." Surely plants with spores as shown in our plate 6, fig. 7 and plate 7, fig. 3, are not identical in this respect. Massee's conclusions were probably reached by examination of Ellis' Exc. No. 22, labeled subterraneum, but in reality the small spored form and hence circumscissum.

Specimens in our Collection.

Washington, W. N. Suksdorf. *Colorado*, E. Bethel, E. B. Sterling, F. K. Vreeland. *Nebraska*, Rev. J. M. Bates. *Kansas*, E. Bartholomew. *Minnesota*, Minn. Bot. Survey. *Michigan*, B. O. Longyear.

Hungary, Dr. Hollos.

218—MITREMYCES.

This genus having dry spores, but no capillitium, we have placed in the Tribe Sclerodermeae (see Genera of Gastromycetes, p. 11). It has little in common with Scleroderma, and is placed herein for convenience (see note l. c.) It is a peculiar genus, none being stranger in the entire puff-ball family, presenting, as it does, many characters possessed by no other genus. One of the species has the peridium red, while all of the American species have mouths of peridium red. "Red" puff-balls are so exceptional that they are of particular interest. In addition, young plants of the most common species are enveloped in a thick gelatinous, volva-like peridium; no other genus has this character.

THE GELATINOUS EXOPERIDIUM.

The manner in which the gelatinous layer separates from the inner peridium has been variously described and illustrated. I think the conclusions are all based on observation, but concern different species. In fact, I believe the manner of separation of the gelatinous layer is peculiar in and to each of our three species. Bosc, who was one of the first to describe and illustrate the plant, says in substance: "The globose head is covered with a glutinous volva, which opens at the base in eight or nine divisions, which falls off at maturity." His illustration shows the layer as a kind of cap, free and lobed at the base.*

Bosc's cut is no doubt a crude representation of any species, but is probably based on Ravenelii or lutescens.

Prof. Beardslee writes me: "Mitremyces Ravenelii, as I have found it in a dozen stations at Asheville, has no gelatinous coat, but is always covered with a scurvy coat which breaks away from the base first, the last piece separating like a cap from the apex."

Hitchcock states: "It (the exoperidium) opens at the top, beginning to separate into numerous divisions or rays, like the petals of a flower." This refers to Mitremyces lutescens only, the remains of these dried "rays" being shown in our illustration (plate 9, fig. 1).

I have had an opportunity to observe the separation of the exoperidium of Mitremyces cinnabarinus, which however, no way resembles either of these descriptions. Nor does Burnap's description (Bot. Gazette, 1897), and his figure (4), in my opinion, correctly present it.

The exoperidium is not, as seems to be the general supposition, a uniform gelatinous layer like the volva of a phalloid. It appears to be of two layers, a very thin inner cartilaginous layer (bright red in M. cinnabarinus), to which is attached a thick gelatinous outer layer.

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*It is probably in reference to this that Nees von Esenbeck selected the name Mitremyces, viz., mitre fungus, comparing this cap to the head-dress known as a mitre. I formerly thought it referred to the raised mouth with its "mitred" grooves. (See Myc. Notes, p. 69).

The separation of the exoperidium is effected by the cartilaginous layer breaking into areas and *curling in*. The separation is caused, in my opinion, by the fact that the cells of the thick gelatinous portion swell and expand by the absorption of water, while those of the inner layer do not, hence rupture occurs. At first it causes a "buckling" of the layer shown in plate 8, fig. 2. Next, the layer is torn by the swelling of the outer gelatinous portion without a corresponding expansion of the inner (see plate 8, fig. 3). Finally the pieces curl inward and fall off. Frequently we find a mass of these gelatinous fragments of the exoperidium on the ground encircling a plant. They appear like a cluster of "fish eggs," only the nuclei are red, instead of black.*

THE GENERIC NAME.

Nees von Esenbeck illustrated and called this plant Mitremyces in 1816. For over seventy years his name was accepted and used, practically by all mycologists the world over. A monographer wishing to make a change and attach his name to nine of the ten species he considers, digs up from an obscure French journal a doubtful name (Calostoma), known but rejected by such men as Fries and Schweinitz, and attempts to change the accepted usage of seventy years. Others may follow if they wish, but not I.

The genus Husseya of Berkeley, as clearly shown by Massee, is not different.

THE MOUTHS OF MITREMYCES.

Among the Gastromycetes, the mouths of all species of Mitremyces, as far as we know, are peculiar to this genus. They are raised, rayed, and open by longitudinal slits along the rays. In addition, whatever may be the color of the peridium, the mouths of all the American species are *red*. A good idea of their appearance can be obtained from our plates, also from Morgan's figures. They are very poorly and inaccurately shown in Massee's plates.

THE SPORES.

No other genus has, to my knowledge, spores colored like Mitremyces. They are pale ochraceous, or sulphur color. In shape they are either globose or elliptical. There are no capillitia, but usually remains of hyphæ tissue are observed mixed with the spores, (shown in plate 9, fig. 6). In this respect alone the genus approximates Scleroderma.

THE SPORE SAC.

The spores are contained in a separate membrane or sac, at first lining the endoperidium. As the plant matures this spore-sac contracts, forcing the spores through the slits of the rayed mouth. So

*Massee states "the structure is in every respect homologonous with the peridium in the Phalloideae, but differs in being entirely deliquescent at an early period; hence no trace of its presence is to be seen in mature specimens." The exoperidium no more separates by deliquescence than does the cortex of a Bovista. It is a mechanical action of absorption of water by a gelatinous substance, but it does not deliquesce, and the use of this word in connection with the phenomenon is misleading.

far as I know this method of spore dispersion noted and described by Hitchcock nearly eighty years ago, is peculiar to the genus. The series of photographs by Prof. Beardslee, (plate 8, fig. 7), show this spore-sac in various states of contraction.*

THE ROOTING STRANDS.

Another feature unknown to me in other genera, is the long, thick bundle of root-like strands by which the peridium is attached to the soil. These strands are somewhat gelatinous when fresh, but dry, hard and rigid. They are shown in all our photographs of the various species.

CLASSIFICATION.

The original species was early figured and described from this country. The genus has since been found in India, Java, Australia and various portions of the world, but it does not occur in Europe. We have in our collection specimens only of the American forms. Our native species were very much confused and but little known until a young man by the name of Burnap, one of Prof. Farlow's students, straightened them out in 1897.

KEY TO THE SPECIES.

Spores globose ..... M. lutescens.
Spores elliptical.....
  Endoperidium red..... M. cinnabarinus.
  Mouth only red..... M. Ravenelii.

219—MITREMYCES LUTESCENS.

(Plate 9).

Rooting strands long, compact, yellowish. Exoperidium light yellowish, rough externally and but slightly (if at all) gelatinous,† separating by splitting into irregular segments, which remain (partially) at the base of the endoperidium like the petals of a flower. Endoperidium pale orange yellowish, smooth. Rayed mouth bright red when fresh, fading out in old specimens.

Spores globose,‡ verrucose, 7–8 mic.

This species, I judge from plants that have reached me, to be the rarest of all. It is readily distinguished from all other American species by its globose spores and *yellowish* peridium. Burnap has seen specimens from Alabama and West Virginia. We have them only from Tennessee and District of Columbia. Prof. Shear tells me he finds it to be the common species about Washington, D. C.

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*Massee notes that the sac sometimes protrudes through the slits of the mouth. We think this is unusual, as we have never seen an example, although we have collected and handled hundreds of specimens.

†These conclusions about the exoperidium are derived from the dried specimen. I have never seen the plant growing. Possibly my opinion as to the slightly gelatinous nature of this membrane is in error,

‡. Schweinitz (1822), illustrated Mitremyces lutescens with *globose spores*, and well shows other characters of the plant, and it would appear from his published work that he knew cinnabarinus. It is therefore strange that the specimens in his collection to-day, as well as the specimens he sent Berkeley, labeled "lutescens" *are cinnabarinus.* Corda (1842), pointed out the spore distinction between lutescens and cinnabarinus, but put them in two genera. Massee, misled by Schweinitz's misnamed specimens (1888), states that lutescens is the young condition of cinnabarinus, while Morgan (who only had cinnabarinus) (1889), states that "they are evidently the same species."

SYNONYMS.

Schweinitz, it would appear from his publication, had a clear idea of this species, but the specimens he left are cinnabarinus. Morgan and Massee confused lutescens and cinnabarinus in their work.

Specimens in our Collection.

Washington, D. C., F. J, Braendle, C. L. Shear; *Tennessee*, H. M. Caldwell.

220—MITREMYCES CINNABARINUS.

(Plate 8).

Rooting strands long, compact, dark when dry. Exoperidium bright red, smooth internally, the outer layer thick gelatinous when fresh. The method of separation is explained in detail on page 123. Endoperidium and rayed mouth, bright red when fresh, partially fading in old specimens.

Spores elliptic-oblong, punctate-sculptured, varying much as to size in specimens from different localities, and even in the same specimen. West Virginia specimens 6–8 x 10–14 mic. Massachusetts specimens 6–8 x 12–20 mic.

This is our most common and widely distributed species. Its home is the Alleghanies, but it grows as far east as Massachusetts and as far south (probably) as Florida.* It does not occur in the Western States.

SYNONYMS.

This plant has been called Scleroderma calostoma, Calostoma cinnabarinum, Lycoperdon heterogeneum, Lycoperdon calostoma, Mitremyces heterogeneus, Gyropodium coccineum, and was distributed by both Ellis and Ravenel as Mitremyces lutescens and was so called by Morgan.

Specimens in our Collection.

Massachusetts, Mrs. E. B. Blackford, Geo. E. Morris, Hollis Webster, Clara E. Cummings. *Pennsylvania*, Chas. McIlvaine, (Dr. Herbst has found it, but I have none of his specimens). *West Virginia*, H. C. Beardslee, C. G. Lloyd (abundant at Eglon, W. Va., near the summit of the Alleghanies). *Georgia*, A. S. Bertolet. *North Carolina*, H. C. Beardslee, Ed. R. Menninger, A. G. Wetherby.

221—MITREMYCES RAVENELII.

Rooting strands long, slender.† Exoperidium breaking into very small flakes, which usually dry up and remain attached to the inner peridium.‡

Endoperidium dark brown when dry (**), usually rough with adnate scales, remains of the exoperidium. Rayed mouth bright red.

Spores elliptic-oblong, slightly sculptured, (††), varying much as to size 5–8 x 10–15 mic. This plant is close to cinnabarinus, from which it may be known by the small persistent exoperidium scales and by not having a red endoperidium. It is widely distributed, but not so abundant as cinnabarinus.

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*While in Florida several winters ago I was asked by a native if there was a "red puff-ball." He said he had seen it, but his neighbors thought he was mistaken.

(†). Berkeley makes the "short" rooting strands a feature of the species. It is evident his specimens were not perfect.

(‡). At least in our herbarium specimens, this is a very constant character.

(**). On macerating a specimen the peridium becomes lighter color, and is, I think, ochraceous when fresh.

(††). They have been described as smooth. Young spores, both of this species and cinnabarinus are relatively smooth, but both are decidedly sculptured when ripe.

Specimens in our Collection.

Pennsylvania, Dr. W. Herbst. *District of Columbia*, F. J. Braendle, C. L. Shear. *Tennessee*, H. M. Caldwell. *North Carolina*, H. C. Beardslee, Hannah C. Anderson.

222—MITREMYCES RAVENELII VAR. MINOR.

(Plate 9).

We have received a beautiful lot of these little specimens from F. J. Tyler, collected at Fort Ethan Allen, Virginia. Our first impressions led to the conclusion that they were distinct from either of the three species with which we were familiar, but Prof. Patouillard, to whom we sent specimens, considers them a form of Ravenelii. While in general appearance the plant is very different, still I can see no marked point of distinction on which to base a species. They are much smaller; the peridium much smoother; the rooting strands very much less developed and not broadly attached to the peridium, but rather separating and forming a kind of cup as shown in plate 9, fig. 7. In addition, the spores are much smaller, and the long axis in some is so relatively short that some spores are almost globose.*

It appears to us that this must be the same plant that Berkeley has called M. Ravenelii var. minor (Grevillea, vol. 2, p. 51). In deference to Patouillard's opinion we consider them a variety of Ravenelii, but we shall not be surprised if it be finally shown that they are entitled to specific rank.

Specimens in our Collection.

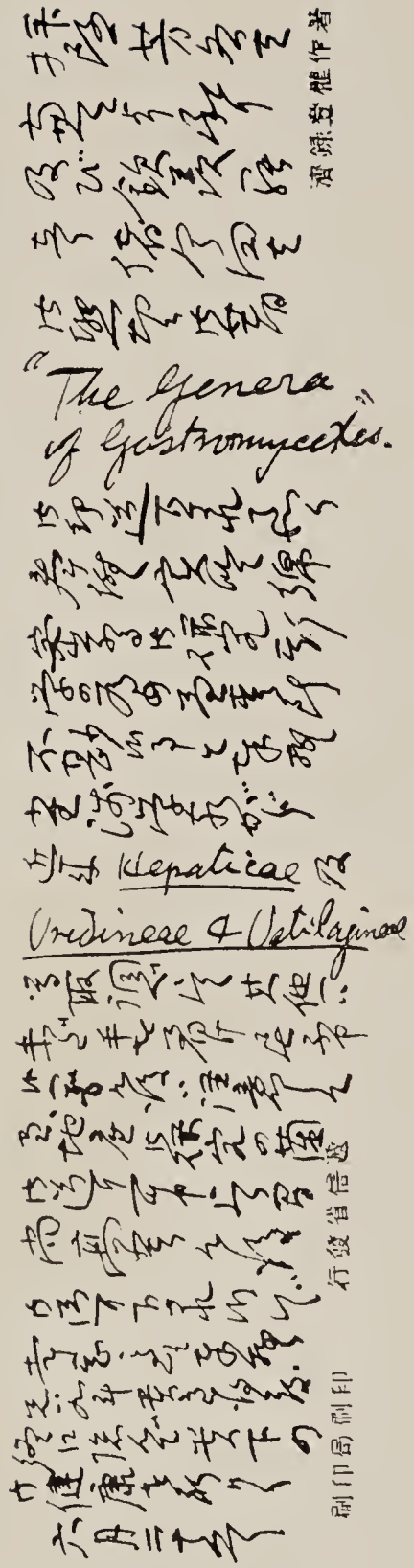
Virginia, F. J. Tyler.

223—A DIFFERENCE OF OPINION.

"Bovista dealbata Lloyd, is in my opinion, identical with B. tomentosa Vitt. (B. minor Morgan). I beg that you will examine the spores of the ripe specimen, magnified 750 diameters, and you will find them very finely punctate." Extract from private letter from Dr. Hollós.

This plant by another eminent European mycologist has been referred to B. plumbea, and by still another is considered a distinct species. We have here three conflicting opinions regarding the very same plant, thus indicating that it is very easy for different workers to differ as to the identity of plants. It is this difference of views that makes the study of mycology so interesting. If everybody thought alike and the plants were all worked up, the study would lose much of its fascination. No exception can be taken by anyone because others differ as to classification of any particular plant. We are aiming both to describe and illustrate the plants by photographic process in order that others may *recognise them.* Our object is to issue a work that will enable readers to know *the plants concerned.* If we succeed in doing this, others are welcome to disagree with us as to the name the plants should bear. Let us be liberal enough to grant every man a right to his own opinion.

(*). On our first examination of the spores we thought they were globose, and that it was probably Mitremyces Berkeleyii, and as far as external appearance and size go, is well represented in Massee's figure of that species. We forwarded specimens with a query to the herbarium at Kew, and our opinion was confirmed. As on further examination the spores proved not to be globose as shown in our microphotograph (plate 9, fig. 8), if the plant is M. Berkeleyii, the spores of that species are not correctly described or vary as to shape.



224—A LETTER FROM THE ORIENT.

As evidence of the wide-spreading interest that is now being taken in the study of Gastromycetes, we reproduce herewith a letter received from Mr. T. Yoshinaga, of Japan. Many of our readers will be interested in Mr. Yoshinaga's letter and the information that he gives. It is an evidence of the rapid strides in all directions, and especially in science, that our young nation of the Orient is getting quite proficient in botanical matters. A regular botanical journal is issued, which is received at the Lloyd Library, and is printed very much as the accompanying fac-simile, and is, no doubt, full of valuable information. We have a complete set of the publication, some ten or fifteen volumes, and all who wish to read it can have access to it at our library. You will, no doubt, be interested in the information as given by Mr. Yoshinaga in his communication of July 18th, reproduced herewith.

225—GEASTER FORNICATUS, from this country.

We have received from Mr. W. H. Long, Jr., Denton, Texas, specimens of what we consider the true Geaster fornicatus of England, as illustrated in Fig. 55, page 29, of the Geastrae pamphlet. We think this plant occurs but very rarely in this country, and that probably this is its first collection. We have seen no specimens of it in the Eastern collections, nor has it ever reached us from any other correspondent. The records of "Geaster fornicatus" from the Eastern states are, we think, of a very different plant, which we have called Geaster coronatus in the pamphlet.

226—RAFINESQUE'S "PIPE DREAM."

In looking over some old journals, I ran across Rafinesque's announcement of his book on fungus. While I feel that Mycology is to be congratulated on the fact that the book was never issued, I reproduce the "announcement" as a curiosity.

It was very "prior" (1808), and I realize that I thus place for ready reference material for the modern "priorist" busily engaged in digging up old names for new combinations to which may be affixed their own.

In our opinion, the modern priorist, who cannot with the aid of a vivid imagination, find herein a new combination to supplant almost any name in use now, will not be very enterprising.

"The second work I mentioned will be named, an essay on the natural history of the mushrooms or fungusses of the United States of America. It is intended to be a complete treatise of all the plants of that class which have been discovered in the United States, in which I shall consider them as forming a distinct class from the other acotyledonous plants, instead of only a tribe; and the different divisions of Persoon, in his Synopsis fungorum, will be considered by me as so many different orders or tribes. I shall describe in this work nearly eight hundred and fifty species or varieties of American mushrooms, of which one-half will be new orders, and most of them elucidated by plates; name all the places and situations where they are found in the United States, and give the complete and accurate description and history of the new ones, not forgetting to enlarge on their fructification, principally for the new genusses, of which I shall have eighteen at least, besides the three already described in the annexed essay. Of these I will give you the names, etc., viz.:

Astrycum, (multifidum, quinquefidum, dimidiatum, etc.), this genus belongs to the tribe of the licoperdoideous; it does not open, and the seeds are dispersed in the centre. In New Jersey and Penn.

Piesmycus, (violaceus, nigrescens, etc.), of the licoperdoideous tribe likewise, but coriaceous, with seeds pulverulent and attached to numerous interior threads, etc. In Penn.

Dycticia, (clathroides) akin to clathrus, but without volva. Found in Delaware.

Acinophora, (aurantiaca) akin to tulostoma, but bearing berry-like seeds. In Penn.

Colonnaria, (urceolata, truncata, etc.), divided into four pillars, united at the top, which bear the seeds in the margin. Found in Penn.

Cerophora, (clavata, globosa, pyriformis. thamnioides, dichotoma fastigiata, minuta, etc.), is a fine new genus, akin to *hydnum*, but the fructification is in horn-like terminal papillas. Found in different states.

Dicarphus, (rubens) very curious mushroom, with two sorts of fructifications, something like the *thelephora* uppermost, and hydnum underneath. I found it in Penn.

Priapus, (niveus) singular mushroom, which has the form of a *phallus*, and the fructification of the *hydnum*. In Virg.

Pyrisperma, (hypogea), a sort of truffle, growing under ground in the sands of New Jersey.

Sternastrum, (bosen), it resembles a *geastrum* that should be pediculated, but bears large seeds, etc. In Virginia.

Phorima, (betulina, coccinea, minuta, etc.), resembling the sessile *boletus*, but bearing underneath small concave cavities instead of pores. Found in different states.

Leptopora (nivea stercoraria, difformis, etc.), differs from the sessile boletus by its substance, and being covered all over by pores. In different states.

Eriosperma, (alba, fugax, etc.), the fructification is in a wool covering them. In Penn.

Gelatina, (fœtidissima, lutea, rubra, alba, etc.), it consists in a jelly almost amorphous, growing upon wood in many states.

Xylissus, (lineatus oblongus, cylindricus, etc.), sort of mucor growing upon wood, of which the peridium becomes a mass of seeds at maturity. Found in Penn.

Hypolepia, (Igniarias difformis, etc.), this singular production, which is called *punk* in some parts of the United States, grows under the bark of decayed trees, and resembles a piece of tinder.

Hydromycus. (tremelloides, aquosus, etc.), this mushroom joins those plants with the *tremella*. It grows in rivulets, or moist places, on the roots of trees in New Jersey and Penn.''

DICTYBOLE TEXENSIS.

A curious Phalloid has been found by Mr. Long, of Texas, and published in the *Botanical Gazette* with the cut which we reproduce here.

The *Botanical Gazette* is largely devoted to physiological botany, and its circulation among systematic mycologists is necessarily restricted. We are, therefore, pleased to give the plant a more extended notice by reproducing it in Mycological Notes. Our publication is sent to more than seven hundred addresses, almost everyone of them working mycologists, and located in all parts of the world.

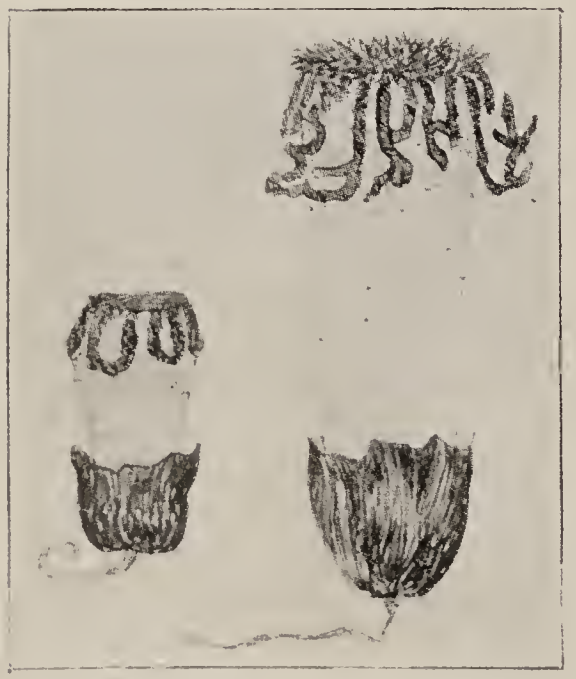


Fig. 64.
DICTYBOLE TEXENSIS.

Dictybole texensis seems to have a similar structure to the genus Itajahya as illustrated in Engler & Prantl. A better idea of the plant can be obtained from the cut than from the description, and it is to be regretted that the section of the Phalloid was not given as was done with Itajahya. ''The sterile plates in upper part of gleba numerous, short and narrow, arranged in a more or less radiating and imbricated manner; latticed portion with large

oblong rings, the surface rugose, and in age loosening out into a large, open, irregular mesh. Spore bearing tissue between the sterile plates and lying between and over the lattice work.''

We hope some day to present our readers with photographic reproductions made from the fresh plant. The accompanying cut is evidently much reduced, as the plant is described as being from 7–10 cm. high.

227—TORRENDIA PULCHELLA.

We are very grateful to Rev. Camillo Torrend, of Portugal, for specimens of this most curious Gastromycetes, recently described by Bresadola in ''Revista de Sciencias Naturaes do Collegia de S. Fiel.'' We are enabled now to illustrate this plant, which is strikingly different in many respects from all Gastromycetes heretofore known. It is pure white, of a soft gelatinous-fleshy nature, and in general appearance resembles a little Amanita. Instead, however, of having the spores borne on lamellae, the hymenium lines cells of the tissue of the pileus. The excellent illustration prepared by Bresadola, which we reproduce, gives a much better idea of the plant than is possible from description.

In this connection it may not be amiss to give a little personal history of Father Torrend and his Order, which we have learned from an outside source. He is a member of the Order of the Jesuits. We have the highest appreciation of the work that has been done for science by members of this Order, although owing to their modesty and self-sacrifice, it is rarely brought to the notice of the average reader. To this it might be added that the Order of the Jesuits is a teaching order, and the members are chiefly engaged in educational work in all portions of the world. No one can join the Order unless he assumes the obligations to devote his life to study, teaching and other occupations which are considered to promote the honor of God and the spiritual welfare of his fellowmen. He must be a man of learning, and as they renounce all claim to personal property, must be a man of absolutely unselfish views. While not a member of the Catholic Church, I have several correspondents in the Order of the Jesuits. I do not believe a more scholarly, learned, or unassuming class of men are engaged in the study of science than are to be found in this Order, and to them the world of science is indebted to a degree that few recognize. The patient investigation of these men commands our sincerest admiration.

Fig 65.
TORRENDIA PULCHELLA—A young plant, mature, and section. All natural size.

228—MYCENASTRUM CORIUM.

The station farthest East from which we have ever received this plant is near Chicago, Ill., see Mycological Notes, page 119. In his last report, Prof. Peck records this plant from Crown Point, New York.

229—ANTHURUS BOREALIS IN GERMANY.

It is simply a confirmatory incident to illustrate our position that the fungi of this country and Europe are practically the same, when Prof. Henning finds growing in Europe Anthurus borealis, a plant that was described as a "new species" from this country less than ten years ago. It is quite a notable addition to the mycological flora of Europe. Compared to our phalloids their phalloid flora is very scanty. It is very confirmatory of our views on the distribution of plants that every phalloid that occurs in Europe has been discovered in the United States although we have quite a number of species that they do not find in Europe. Prof. Henning describes the plant he finds as differing from the American species in some slight particulars and calls it Anthurus borealis var. Klitzingii.

230—THE NAME "PILA."

"I notice one thing in your remarks on Bovista pila that makes me think you have misunderstood Berkeley's name, and I trust you will pardon me for calling your attention to it. You speak of the name as an inappropriate one because the plant is never 'pilose.' I do not find that he says in his description that it is pilose, and I have always taken the specific name to be the Latin word pila, 'a ball,' which would not be very inappropriate since the fungus is so generally like a ball. If Berkeley had wished to express a hairy character or even a name suggestive of that character, it seems to me he would have written Bovista pilosa."—Extract from letter of Prof. Chas. Peck.

There is no doubt that Prof. Peck has this matter straight, and that we were entirely wrong. Although our limited knowledge of Latin is scarcely more than a memory of our declensions in our boyhood school days, a blunder of this kind is inexcusable, for before accepting as fact, or making a statement of this kind, we should have referred to a Latin dictionary. To be candid, we did not question that Berkeley's name of the plant referred to the supposed "pilose" nature of the plant and blundered in doing so. We desire to express our best thanks to Prof. Peck for having so courteously called our attention to this matter, and thus enabling us to correct a misstatement. In this connection we take the opportunity to say that in our record of all plants considered by us, we wish to publish *facts* only, and we are more than thankful to be advised of any mistake that we may *promptly correct it*

231—ANOTHER SPECIES OF CATASTOMA.

Since most of this pamphlet has been in type we have received from W. H. Long, Jr., Texas, a species of Catastoma very different from the three described. We think it is a species of Australia, but it is a novelty in the United States. Externally it resembles Bovista pila and the adherent exoperidium does not form such a prominent cup as in other species of Catastoma. We expect the plant will be considered and illustrated in some future issue of Mycological Notes.

MYCOLOGICAL NOTES.

BY G. G. LLOYD.

No. 14.

CINCINNATI, O. MARCH 1903.

232—THE TYLOSTOMEAE.

This tribe is distinguished by having a long stipe which is distinct from the peridium The only other tribe of truly stalked puff-balls (Podaxineae), has the stipe continuous to the apex of the peridium, forming an axis. We have representatives of five genera.

KEY TO THE GENERA.

Peridium opening by circumscissile dehiscence	Battarrea.
Peridium not dehiscing circumscissile.	
Stipe inserted in a "socket" in base of peridium.	
Small plants, mouth apical	Tylostoma.
Large plants dehiscing irregularly	Queletia.
Peridium seated on the broad apex of the stipe.	
Peridium opening by an apical mouth	Chlamydopus.
Peridium opening irregularly	Dictyocephalos.

233—BATTARREA.

A curious genus with a long stipe, and a peridium that dehisces circularly, the top part coming off like a lid. We have two species in our collection from the Western States, but are not sure about them, and therefore will not publish the species until we can further satisfy ourselves.

234—TYLOSTOMA.

Fig. 66.
Under veiw of peridium, showing "socket." (Enlarged.)

This genus is represented by a number of species in this country, and I have thus far been able to do very little with them by means of the literature on the subject. They are all little stalked plants, as shown in figure 67. The peridium has at the base a kind of "socket" into which the stipe is inserted. We expect at some future day to present a paper by which our species may be recognized. It is impossible to do it now.

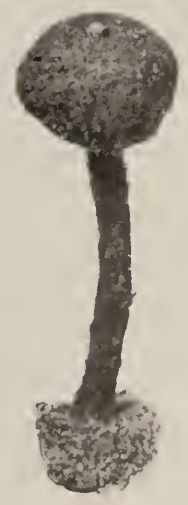


Fig. 67
Tylostoma.
(Natural Size.)

235—CHLAMYDOPUS.

We have in our Western States a single representative of this family. The genus is close to Tylostoma, and it is still considered by some authors (Hollos, Fischer), as a synonym for Tylostoma. Spegazzini, who proposed the genus. distinguished it from Tylostoma by the persistent volva at the base of the stipe. and by the broad attachment of the stem to the peridium. The first distinction is of little value, as several Tylostomas have volvas more or less persistent as cups at the base of the plants. The second, however, we consider of sufficient importance for generic distinction.

In Chlamydopus the peridium is seated on the broad top of the stipe. In Tylostoma the slender stipe is inserted into a kind of "socket" in the base of the peridium. In addition, as Miss White notes, the general appearance of the two genera are different. In Chlamydopus the plant is smooth, no portion of the volva remaining attached to the plant save the cup at the base. In Tylostoma the volva is of the nature of an exoperidium, partially persistent at the base of endoperidium. Prof. Patouillard, (to whom we had the pleasure of sending specimens), notes there is a marked difference in the basidia of the genera.

236—CHLAMYDOPUS MEYENIANUS.

(Plate 10.)

Entire plant smooth, light color. Peridium globose, smooth, 1½–2 cm. in diameter, dehiscing by a torn mouth, borne on the broad concave apex of the stipe. Columella none. Spores rust color, subglobose. verrucose, about 6 mic. in diameter. Capillitium light yellow, almost hyaline under the microscope, much branched and interlaced, sparingly septate. Stipe long, thick and concave at the apex, tapering down, smooth, sulcate, with almost woody texture. Volva persisting (normally) as a cup at base of plant, covered with adhering dirt. (The volva is usually absent from herbarium specimens).

Prof. C. V. Piper, who has kindly sent us the specimens, furnished the following interesting notes to the habits of the plant, and it is the first published account of them:

"The plant is by no means rare in the drifting heaps of sand in the vicinity of Pasco. As it usually grows, nothing but the peridium is exposed all the remaining part being subterranean. This point, however, varies with the looseness of the sand, in some cases the wind exposing nearly the entire plant. Where, however, the sand is fairly firm, the whole stipe is underground. The length seems to vary wholly with the amount of loose sand through which it must grow to reach the surface."

Chlamydopus Meyenianus was originally collected in Peru and sent to Klotzsch, who described and figured it as Tylostoma Meyenianum. The plants and figures had no volva at the base, but were otherwise quite characteristic.(*)

(*) Dr. Hollos has kindly forwarded to me a drawing of Meyen's specimens preserved in the Museum at Berlin. There is no question as to its identity with our American plant.

The American plant seems heretofore to have been collected only in New Mexico.(*) There is a specimen in Ellis's collection from E. A. Wooten, New Mexico.

SYNONYMS.

Spegazzini, a South American botanist, has beautifully figured the plant and called it a new genus and a new species, Chlamydopus clavatus. He was the first to show the volva at the base of the plant. We think the genus is valid, but there is no reason for the new specific name, save lack of knowledge of Klotzsch's plant. Miss White adopts Spegazzini's name, illustrating the weakness of the attempted use of "priority rules" without knowing the facts.

Morgan illustrates as "Tylostoma Meyenianum" a plant that cannot be Klotzsch's species, and is probably Tylostoma obesum, and does not belong to the genus Chlamydopus.

Specimens in our Collection.

Washington, C. V. Piper.

237—QUELETIA.

This genus consists of a single known species described by Fries (1871), from specimens sent from France and named for Dr. Quelet, a French writer of mycology. It may be likened to a huge Tylostoma, having the same rust-colored gleba and the stipe inserted into a "socket" at base of peridium. The peridium does not have a definite mouth, but breaks irregularly after the manner of a Calvatia. Were it not for this character, it would be difficult to say how it differs from Tylostoma save in its size.

238—QUELETIA MIRABILIS.

(Plate 10.)

Plants from 3 to 7 cm. in diameter, stems 8 to 15 cm. long. Cortex apparently a thin white coat that breaks up into granular particles and mostly disappears, very much the same as that of Bovista plumbea. Endoperidium firm, hard, brown, cracking open irregularly when mature. Stem long, (†), ragged and shreddy externally. It is inserted into a socket at the base of the peridium, like the stems of the little Tylostomas. Spore mass, dark rusty brown. Capillitium light colored, under a microscope almost transparent, tubular (‡), branched, thick, usually with blunt ends and rarely at all tapering. Spores globose, coarsely warted, 5–6 mic.

Our good friend, Dr. Wm. Herbst, of Trexlertown, Pa., is fortunate in being the only collector to have ever found the plant in this country, and its occurrence with him was most mysterious. On a pile of spent tanbark at an abandoned tannery, a short distance from

(*) I presume the specimen sent Berkeley by Wright from New Mexico was correctly determined, as it is evident from Berkeley's remarks under Tylostoma angolense that he was familiar with Klotzsch's plant.

(†) None of Dr. Herbst's specimens that we have seen have a thick, obese stem, as originally illustrated by Fries, and copied by Engler & Prantl, and Miss White.

(‡) That it actually consists of little tubes can be demonstrated by shaking in alcohol and watching under a microscope as the alcohol dries out. Little bubbles of alcohol can be seen running through the tubes.

Dr. Herbst's house, in August, 1892, this plant grew in great abundance. Not a single specimen ever grew on that pile before or since, and has not been found elsewhere in the United States. (*) Dr. Herbst's specimen is identical in every respect with specimens received from France.

Specimens in our Collection.

Pennsylvania, Dr. Wm. C. Herbst. *France*, N. Patouillard.

239—DICTYOCEPHALOS CURVATUS.

(Plate 11).

One of the strangest plants that has been brought to the notice of mycologists in the last few years is the above, described by Prof. Underwood in 1901. It grows in the arid, alkaline regions of the West, and is a very rare plant. The only collection now known is in the herbarium of New York Botanical Garden.

The plant has a thick woody volva, which remains as a cup at the base as shown in our plate, portions being also adherent to the peridium. The stem is long (the specimen photographed measuring 35 cm.) hard woody, solid. tapering to the base. It is very firm, hard texture, and reminds one more of a portion of a ligneous plant than what would be expected in a Gastromyces. At the top is a kind of false collar, the adherent portion of the peridium. The peridium is thick, rough, hard, flattened pyramidal in shape, (our illustration shows the broad side) "rupturing irregularly" (according to Underwood), but we saw no specimen where the peridium had dehisced, simply where they had been broken off from the stem. Capillitium septate, branched. Spores sub-globose, warted. 5–6 mic.

This curious plant was found by Mr. E. Bethel in 1897, and sent to Prof. Ellis with the following notes:

"These plants are very odd looking in their native haunts; they grow on a soft alkaline adobe soil. Some of them had lifted themselves entirely out of the ground, while others had the stalk standing in about one inch of soil. They presented a very fantastic appearance, as there was little or no other vegetation about.

Some of the specimens were very much bent, approximating a semi-circle, others were twisted like a corkscrew, with the portions of the stalk split and bent back. I think the chief factor in lifting the plant out of the ground is this twisting and bending back of the portions of the stem during dessication."

SYNONYMS.

While we have no positive information, we feel very sure it is the same plant that was imperfectly described by Prof. Peck in 1895 as Battarrea attenuata. In the light of Prof. Underwood's excellent description and illustration, we do not believe that anyone can read over Prof. Peck's description without reaching the conclusion that it is the same plant. However, regardless of what the future may develop in this connection, we shall always advocate and use the name Prof. Underwood gave, on the merits of the case.

(*) Miss White states that Prof. Peck thinks the spores were introduced with imported tan-bark. That is not possible, for there was never a pound of any but local Chestnut bark used in that tannery. The hides were imported from South America, and if the plant grows there might be a solution of the mystery. The plant is only known from France, and is not recorded by Spegazzini, who has published the fungi of several South American countries.

240—THE PODAXINEAE.

This tribe is characterized by having a stalk continuous to the apex of the peridium forming an axis. Some of the plants are short stalked, some long stalked. The tribe forms a natural connecting link between the Gastromycetes and Agarics. Thus Podaxon is a true Gastromycetes with capillitia mixed with spores. Cauloglossum is close to Hymenogasters, with its permanent gleba chambers. Secotium is only a step from Cauloglossum the tramal plates not forming such firm cells. Gyrophragmium is Secotium with the plates more sinuate-lamellate, and Montagnites, which is usually placed with the Agarics, is only a Gyrophragmium with the plates truly lamellate.

KEY TO THE GENERA.

Gleba with irregular, persistent chambers.
  Peridium, elongated club-shaped. . . . . Cauloglossum.
  Peridium, round or conical, (*) . . . . . Secotium.
Gleba with sinuate-lamellate plates. . . . . Gyrophragmium.
Walls of gleba chambers not persistent . . . . . Podaxon.

241—CAULOGLOSSUM TRANSVERSARIUM.

(Plate 12.)

The genus Cauloglossum is represented by a single known species. The other species bearing the name in the early botanical works belong to Podaxon, a very different genus. The only species grows in our Southern States, and was little known until last year (1902), when a very full and excellent account was written by J. R. Johnston (†). The genus with its prominent columella and permanent gleba cells seems to me to stand next to Secotium, from which it differs in its texture and in the thin, irregularly ruptured peridium.

Cauloglossum transversarium grows only in moist situations in our Southern States (‡). The plants are club-shape or broadly oblong, and have a short stalk which is prolonged as a broad columella to the apex of the plant. Externally they are smooth, dark brown, internally "gamboge yellow when young, becoming dirty olive brown," (Thaxter).

The peridium is simple, thin, smooth, and "ruptures irregularly and indefinitely exposing the chambers of the glebe underneath. In some mature specimens is even more or less evanescent, the exposure of the gleba chambers giving a honeycombed appearance to the entire surface," (Johnston). The gleba of an olive color is composed of small, permanent chambers, similar to those of Rhizopogon. The spores are elliptical, smooth, 3 x 8 mic., light brown color, almost transparent under high power.

(*) This distinction between Cauloglossum and Secotium is not satisfactory. The difference between the genera, to my mind, is one of texture hard to express in words. Cauloglossum is close to Rhizopogon as to texture of gleba, Secotium more closely related to Gyrophragmium. Besides, the thin, friable peridium of Cauloglossum is different from the persistent peridium of Secotium.

(†) Proc. Am. Acad. Arts and Sciences, July, 1902.

(‡) Prof. Thaxter (1897), found it "abundantly growing out of the bases of living or dead trees, or upon rotten stumps or fallen logs, or among rubbish on the ground close by." Thos. F. Wood (1880), sent a number of specimens to Prof. Ellis, and wrote: "It grows along the moist margin of a mill pond near Wilmington, N. C., in a loamy soil under the undergrowth. They are quite common. I found the remains of many of them in a semi-liquid state."

SYNONYMS.

This plant has been fortunate in having only one name, Cauloglossum transversarium, applied to it in most books, and it is well established. It was first called Lycoperdon transversarium (by Bosc, 1811). Recently a "juggled" name, Rhapalogaster transversarium, has been proposed for it. (*)

Specimens in our Collection.

Florida, an alcoholic specimen kindly sent us by Prof. Thaxter.

North Carolina, a dried specimen from the Ellis collection kindly given us by Prof. Britton.

We hope our Southern friends will watch out for this plant, and supply us more abundantly.

242—SECOTIUM.

This genus, the name of which means a cell, has always been of interest, as it has always been known as a step towards the agarics, and the only frequent plant we have with this character. Secotium acuminatum is the most frequent species both in this country and Europe. The genus can be divided into smooth aud rough spored species. We have in our collection only one belonging to each section that we will describe. (†)

243—SECOTIUM ACUMINATUM.

(Plate 13.)

So extremely variable is this plant as to shape and markings, that it is hard to describe it, and we believe a reference to our plate (No. 13), will give a better idea of it than we can put into words. (‡) One might well say that several species are depicted there, but it is not practicable to separate them, as widely diverging plants (Plate 13, figs. 6 and 7) grow side by side, and are evidently the same species. The stalk is usually short, but distinct, and is prolonged to the apex of the peridium forming an axis for the gleba.

The peridium is light colored, of a soft texture, not brittle; it tardily dehisces by breaking away at the base, as shown in figs. 1 and 10. The surface is smooth, or spotted with scales, as shown in our figures. The shape is usually acute-ovate, sometimes obtuse, globose or depressed globose. I think it is never truly acuminate, and the name, strictly speaking is a misnomer.

The gleba is composed of semi-persistent, elongated, irregular cells plainly seen under a glass of low power, or even to the eye (see fig. 9). Capillitium none. Spores, globose or ovate globose, *smooth*, often apiculate, 5–6 mic.

(*) The author labors at great length for an excuse to change the name, and devotes more than half of his article to the subject. His conclusions appear to us in brief to be that as this is the only plant that can bear the name of Cauloglossum, all other plants so called belonging to other genera, therefore this cannot bear it and must have a new name to which the author can add his own He does not use the name himself, however, simply proposes it for others use who may be willing to employ an unfamiliar name (if they will add this author's name to the "new combination"). For himself he prefers to use the old, familiar name, and the title of his paper is "On Cauloglossum transversarium Fries (Bosc)."

(†) We have from W. H. Long, Jr., another smooth spored species from Texas that is a novelty as to this country. As Mr. Long is working on a paper on the subject, we do not wish to anticipate him, and will pass further consideration of the plant for the present.

(‡) "I have collected in Hungary more than a thousand specimens of this fungus, and they were of such a variety of color and form that it would certainly be possible to manufacture several dozen species therefrom." HOLLOS.

DISTRIBUTION.

The plant reaches us from almost all sections of the United States except the Eastern States, and is widely distributed, but does not seem to be abundant in any particular locality. It is also widely distributed in Europe, Asia and Africa.

SYNONYMS.

Hollos states that half of the species in Saccardo belong to this one species. He calls it S. agaricoides, which I consider a "juggled" name. It was described from this country first as a Lycoperdon, (to which genus it has no resemblance), as Lycoperdon Warnei, afterwards changed to Secotium Warnei, and under this name usually appears in our literature. I do not think there is the slightest basis for separating our plant from the European plant.

Specimens in our Collection.

Washington, C. V. Piper; *Colorado*, E. B. Sterling, Rollin H. Stevens; *Nebraska*, Rev. J. M. Bates; *Iowa*, L. H. Pammel, T. H. Macbride, L. R. Waldron; *Kansas*, E. Bartholomew; *Missouri*, C. H. Demetrio; *Minnesota*, Mary S. Whetstone, E. P. Ely, Minn. Bot. Survey; *Michigan*, L. E. Weld, C. G. Lloyd; *Illinois*, L. H. Watson; *Ohio*, A. P. Morgan, W L. Aiken, Dr. H. L. True, C. G. Lloyd; *Kentucky*, H. Garman; *Alabama*, C. E. Baker; *Texas*; W. H. Long, Jr.; *Canada*, J. Macoun; *Hungary*, Dr. L. Hollos.

We think the plant does not occur in the Eastern States.

244—SECOTIUM MACROSPORUM.

(Plate 13.)

Peridium subglobose, smooth, 1½–3 cm. Stem very short, or none. Spore mass dark brown. Columella slender. Spores *large*, globose. apiculate, *rough*, 10–12 mic.

This little species is described from specimens sent by E. P. Ely from Dallas, Texas. It widely differs from our common species by its *large*, *rough* spores (*). It grew, I judge, on the ground. No one else has ever sent me the plant, and W. H. Long, Jr., who has made extensive collections of Gastromycetes in Texas, has never found it.

Specimens in our Collection.

Texas, (Dallas), E. P. Ely.

245—SECOTIUM RUBIGENUM.

Our knowledge of Secotium rubigenum (†) is confined to an examination of specimen in Ellis's collection. Dr. Hollós claims "it is

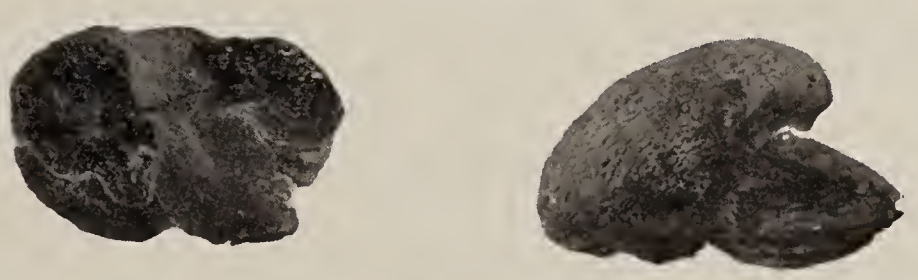


Fig. 68.
Secotium rubigenum. (Natural size.)

only a young" Secotium acuminatum. It impressed us as being quite different. It is of a firmer texture and is dark *red*, both within and without. We have many specimens of S. acuminatum, and have

(*) Prof. Patouillard advises me that he knows but two other species with rough spores Secotium olbium, a curious little species that grows on fallen oak leaves in Southern Europe, and Secotium Mattirolianus, with a long stalk, from Italy. Neither of these plants has any resemblance (save the rough spores), to our little species, as will be noted by referring to the cuts reproduced in Engler and Prantl.

(†) Not Secotium nubigenum, as Hollos and others have copied typographical error in Saccardo.

never noted the least indication to turn reddish (*). Besides, S. rubigenum grew "on logs of Pinus contortus, summit of Sierra Nevada." Our S. acuminatum always grows in the ground.

246—HYPOBLEMA.

The specimen on which the genus Hypoblema is based is in the New York Botanical Gardens labeled Lycoperdon lepidophorum. The genus differs from Calvatia in having a distinct thin membrane lining the peridium. We believe the plant has three peridia. The exoperidium similar to the cortex of Calvatia, remains of which are seen as warts on the specimens. (Plate 14, fig. 1); a thick endoperidium like that of Mycenastrum; and a thin, membranaceous, third peridium covering the gleba. This third peridium is very evident in the specimen, and can be plainly seen in our photograph. If we are mistaken as to these warty remains representing a cortex, we still think the genus is distinct from Calvatia, for then the exoperidium is thick and hard and the endoperidium a thin, distinct membrane, lining the exoperidium, just the reverse of the peridium structures of Calvatia.

247—HYPOBLEMA LEPIDOPHORUM.

(Plate 14.)

Plants depressed globose, from 10 to 20 cm. in diameter. Peridium 1 mm. thick, hard, breaking into irregular fragments like a Calvatia, marked with darker, wart-like, raised blotches, the remains (I think), of a cortex. Lining membrane, soft, paper-like, a dark, thin membranaceous layer, not adherent to the peridium, and entirely covering the spore mass (in all the specimens I saw). While it is more persistent than the thick peridium, it undoubtedly finally breaks up into fragments that fall away. The plants have no sterile base (†). Spore mass, dark olive. Capillitium colored, consisting of slender interwoven branched threads, of a nearly uniform (5 mic.) diameter. Spores globose, echinulate, 5–6 mic.

This plant in its internal structure is the same as the little-known genus Lanopila, if I understand that genus. It differs from all other genera in the nature of its peridium layers as previous described.

SYNONYMS.

The plant was described by Ellis as Lycoperdon lepidophorum, (‡) and compiled into Saccardo as Bovista lepidophorum. It was well described by Morgan as Calvatia pachyderma, but Morgan was mistaken in referring to Peck's Lycoperdon pachyderma, Ellis's Lycoperdon lepidophorum. The two plants are very different in their peridia, their spores and their capillitia. The plant is figured in Gast. Genera as Hypoblema pachyderma.

(*) Hollos states "when the fresh specimen (S. acuminatum), is touched with the finger it acquires rose-red, sometimes blood-red spots." Our American plant does *not*.

(†) So Morgan and Ellis state, we have never seen a specimen cut open.

(‡) The specimens were collected at Huron, Dakota, by Nellie E. Crouch, and are preserved in the Ellis collection. They are labeled Lycoperdon lepidophorum, and there is a note by Ellis, "Morgan probably correct in considering this only L. pachyderma Pk." In reading over Peck's description, I noted several discrepancies and wrote to Prof. Peck, who kindly sent me type material of his Lycoperdon pachyderma. It is a Calvatia, but has neither the spores, capillitia nor peridia of Ellis's plant.

248—DIPLOCYSTIS WRIGHTII.

(Plate 15.)

There are two genera of "puff-balls" (if they are not the same), that widely differ from all others in having the individuals grow densely on a common matrix. We were greatly pleased to receive from L. J. K. Brace, Bahamas, a fine specimen of one of these curious genera. Previously we had seen it, but only fragments.

Diplocystis Wrightii was described by Berkeley from Cuban material in 1865. It is found in several of the West Indies. The individual plants are about ½ cm. in diameter. They are densely seated on a common matrix (*). The exoperidium of each specimen seems to be confluent with the matrix. The top breaks off in a circumscissile manner, and falls away, leaving the base as a cup containing the little "puff-ball." The endoperidium is rather firm, smooth, lighter color than exoperidium. It opens by small apertures at the top (†). Spore mass dark, fuliginous, with no sterile base. The capillitium is very interesting (‡). It appears as shreds (of a membrane) of various diameters, from 3 to 30 mic., branched and interwoven. The thin shreds are almost hyaline smooth, and not widely different from the hyaline capillitium of other gastromycetes. The thick shreds are light yellow colored, and under a high power marked with a dense reticulation. Spores globose, 4–5 mic. smooth or minutely punctate, many short-apiculate.

Berkeley described the curious genus Broomeia from South Africa (§) in 1844. Twenty-five years later he described these plants from Cuba. Although the two genera are evidently close, (and I have seen it stated that they are the same), Berkeley does not indicate how they differ, and does not mention Broomeia in his account of Diplocystis. One would have trouble to conclude from the figures and description in Engler and Prantl what the difference is. I judge from Murray's account of Broomeia (Jour. Linn. Soc.) that the distinction is this. Broomeia has a common exoperidium covering *all* the puff-balls in each cluster. Diplocystis has an individual exoperidium for each endoperidium.

Fischer in Saccardo compiles Discisceda as a synonym for Diplocystis. Dr. Hollós has proven that Discisceda is the same as Catastoma.

249—ARACHNION.

The genus Arachnion can be briefly described as being puff-balls within puff-balls The entire interior of a ripe specimen is filled, not with dust, (spores and capillitium) as most puff-balls, but with a granular substance that feels "gritty" when rubbed between the fingers. These granules are peridioles; they are little sacks containing spores. They are small, but can be seen under a hand-glass, and even with the naked eye. They are the color. and appear as if the puff-ball was filled with ashes. The name Arachnion refers "to a spider sac filled with eggs."

(*) The figure in Engler and Prantl shows them somewhat remote from each other. In all specimens we have seen they are almost contiguous.

(†) It is not a definite, protruding mouth, as shown in figure in Engler & Prantl.

(‡) Berkeley simply states capillitium "lax."

(§) It does not grow at Albany, *New York*, as erroneously stated in Saccardo.

250—ARACHNION ALBUM.

(Plate 16.)

But one species is really known of this genus, Arachnion album, and that was described by Schweinitz (*). It is a very small plant, rarely being over 1 cm. in diameter, and usually half that size.

The peridium is smooth, very thin fragile, and easily breaks into fragments (†). The peridioles, irregular in shape and size from 150 to 250 mic., and under a microscope have a ragged appearance, the membrane being composed of loosely woven hyphæ (‡). Mixed with the ripe peridioles are fragments of hyphæ threads, thick, often septate, but these, I think, are not true capillitium, but rather loose threads from the peridioles. The little peridioles are filled with spores (§), smooth, globose, often apiculate, small. 3–4 mic.

Specimens in our Collection

Texas, W. H. Long, Jr. *Ohio*, A. P. Morgan, C. G. Lloyd. *Massachusetts*, Geo. B. Fessenden.

We think this plant is not so rare as its scanty representation in our collection would indicate, but that is generally overlooked on account of its small size. Spegazzini states it is common in South America, and Patouillard has told me that he has received specimens from the West Indies.

In addition to specimens listed above, we have specimens from F. J. Braendle, Washington, D. C., and Mrs. E. B. Blackford, Boston, that appear to us to be different, being yellow inside when immature, and having thick capillitium threads mixed with the peridioles. At the time we received them we thought they were only a condition of Arachnion album, but now are disposed to think otherwise. They will be further considered in the future.

251—NOTES ON THE GEASTERS.

An author goes to work and fixes up the characters of the various species from material at hand, and thinks he has the subject all straightened out. The trouble is that plants are perverse, and will not confine themselves to the characters authors think they should. You get the distinction between two "species" clear in your mind, and along comes a lot of specimens exactly intermediate, and you do not know to which to refer them. Dr. Hollós has a very simple method of solving all such problems. In genera like Mycenastrum and Polysaccum when the "species" grade into each other, he throws them all without distinction into one species (||). This is an easy way of disposing of a very troublesome subject. If we should consolidate all the Geasters of which intermediate forms reach us from time to time, we will eventually have but one species of Geaster.

The less a man knows about these things, the more he thinks he knows. The more scanty the material from which he works the clearer the species are (to him). These thoughts are strongly impressed on us from studying a lot of Geasters received from W. H. Long, Jr., Texas. It is a section from which we had previously very little material, and many of the forms Mr. Long sends are puzzles to us.

(*) Arachnion Bovista and Arachnion Drummondii are little more than nominæ nudæ, and Arachnion aurantiacum is simply a guess based on Rafinesque's vaporings, and is far more probably Scleroderma flavidum.

(†) Owing to its fragile nature, it is difficult to preserve perfect specimens unless they are very carefully handled.

(‡) Very different from the smooth, firm peridioles of Nidulariaceae.

(§) Easily seen by crushing the peridiole with a cover glass on a slide.

(||) In a letter just received, he writes me he has reduced all species of Battarrea to a single species.

252—GEASTER FLORIFORMIS.

From material sent by Mr. Long and from other sources abundantly since our Geaster pamphlet was issued (cfr. The Geastrae, p. 11 and 43), we are thoroughly convinced that Dr. Hollós is right, that Morgan's delicatus was described from imperfect material, and that the plant does have normally a protruding mouth and often an elongated form.

As Vittadini has therefore more accurately described and figured the plant, we have no further reason to retain Morgan's name. Nor is the plant the "little" species we supposed. In a collection of a hundred or more received from C. H. Baker, Florida, not one of them was as large as a pea, and yet we have in our collection now all grades of size up to 1½ cm. in diameter. As the plant reaches the size of G. mammosus, and as that species is only distinguished by its definite mouth, an unstable character (see The Geastrae, p. 4), we would not be surprised to receive any day specimens that we would not know whether to refer to G. floriformis or G. mammosus.

Among Mr. Long's specimens were a few not so strongly hygroscopic as called for in the description; in fact, had they been sent separately we should have referred them to G. arenarius, This raises the question if G. arenarius is not, in fact, a slightly hygroscopic form of G. floriformis. The plants from Jupiter, Florida, from which the species was described, however, have smaller spores.

OTHER SPECIES.

Among a lot of typically asperate specimens of G. asper were a few evidently the same, but smooth. Is the supposed asperate character of G. asper of any value? One lot of plants were intermediate between G. pectinatus and G. Schmidelii. We have labeled them G. Schmidelii, but it is a question whether they are large, long-pedicellate G. Schmidelii, or small, short-pedicellate G. pectinatus.

As different as our illustrations of G. triplex and G. saccatus var. major may appear, we have specimens not only from Mr. Long, but from others that we do not know whether to consider as a large form of G. saccatus or a small form of G. triplex. As distinct as the extreme forms appear to be, intermediate specimens occur that seem to connect them.

253—A CORRECTION.

In the foot note on page 125, we state that "Corda (1842), pointed out the spore distinction between Mitremyces lutescens and cinnabarinus, but put them in two genera." This we erroneously inferred from what Burnap states (our copy of Corda being loaned). We find on return of the book that Corda "put them in two genera," but he did not "point out the spore distinction," and apparently did not know the plants. He copied the genera from Desveaux and Nees von Esenbeck, and evidently had no suspicion that they were the same.

254—GEASTER RUFESCENS IN WASTE PLACES.

"I found a large patch, probably twenty or twenty-five feet in area, of Geaster rufescens at the corner of Main and Elm streets, Grofton, N. Y. At the corner of the streets named had been a building of the Grofton Bridge Co. This spot apparently had been at some time a dumping place for cinders and shop sweepings, and among which were evidences of iron turnings. Thus the soil was largely impregnated with oxide of iron. Geaster rufescens grew very profusely over the entire area named. I could hardly thrust the point of my cane between them. It was a sight worthy the attention of the most careless observer, but scores of people passed the spot daily without even seeing the plant."—Extract from private letter from Frank R. Rathburn, Auburn, N. Y.

255—THE CLEAVAGE OF SCLERODERMA GEASTER.

"I have found a fine example of the peculiar cleavage of the peridium of Scleroderma Geaster that you have illustrated in Mycological Notes, page 81. It is caused in this case, I think, by immature plants being killed by the cold weather. The spore mass in drying sticks to the inner side of the peridium, and in weathering does not dry as readily as the outer layer of the peridium, which gradually peels off, as shown in your photograph. I have several stages of this interesting process. The plants named were killed about Nov. 23rd, 1902, being the second crop of this species to develop this fall; the first developed in October, the continued rains and warm weather starting a second lot, but as I have stated, cold weather killed them before they matured. In none of the first crop was this cleavage observed, although I collected many specimens, while numbers of the present crop show evidence of this cleavage."—Extract from letter from W. H. Long, Jr., of Denton, Texas.

We do not doubt that Mr. Long has presented a correct solution of this problem, and we are glad to be able to publish the information. Such facts as these ought to be recorded by all means. As Mr. Long states, "I find it much more interesting to study plants than the literature of plants."

256—LEPIOTA MORGANI in EUROPE.

Prof. Bresadola, to whom we sent specimens of Lepiota Morgani, advises us that in his opinion the plant is the same as Krombholz has described and illustrated under the name of Agaricus gracilentus. It has always been supposed in this country that Lepiota Morgani, with its greenish gills, was something unique, the fact having been overlooked that Krombholz described and illustrated Agaricus gracilentus with gills "Blassgrünlich werdenden," and that his figure 14 shows the gills decidedly greenish. The top of the pileus as shown in figure 13, does not have the same scales that our plant has, but Krombholz's figure 16 of his species Agaricus subtomentosus is a perfect illustration of our plant. Although he described the gills as white, we would not be surprised if it turned out that Agaricus subtomentosus

was based on the same plant, because it is well known that the gills of Lepiota Morgani are white until the spores ripen. Certain it is that the figure of Agaricus subtomentosus is a perfect representation of the plant. much better than any that have appeared in this country. We presume in view of these facts that priorists will have to call our American plant "Lepiota gracilenta," and we would consider it very unfortunate if we felt obliged to do the same. We do not undervalue the historical importance of the information Prof. Bresadola has kindly given, although we feel it would be a misnomer to call a plant "slender," when in reality it is the largest and most obese of our species.

257—COPRINUS RADIANS.

Several years ago while at Boston I found some of our Mycological friends puzzling over a little species of Coprinus which had been found in a tuft of Ozonium. They were surprised when I told them it was the most common species that we have in our woods around Cincinnati, and that it usually grows in this Ozonium. It has been a question to me for many years what the connection is between this Coprinus and the Ozonium.

If it were only occasionally that we find the two associated, we might think that in these cases the Ozonium was merely an accidental host. In certain seasons of the year. Coprinus radians grows very common in the woods around Cincinnati. We have noted it hundreds of times, and in almost every instance it grows from a patch either small or large of brown Ozonium.

It is particularly partial to Elm, and an elm tree that has fallen only a year or two and still retains its bark is a favorite habitat for the plant. We have counted over a hundred specimens growing from cracks in the bark of a fallen elm.

Ozonium auricomum, as named by Link, is very common on fallen branches of elm, forming a dense cushion of coarse brown fibers. It looks not unlike coarse brown wool. You find it in Engler and Prantl (p. 517), under "Sterile Mycelium of doubtful belongings," and described with "fructification unknown." It was considered by Fries as a sterile mycelium. Rarely do we find it in the proper season in this locality that a number of specimens of Coprinus radians do not grow from it. The question that I have tried to solve is, "Is it the mycelium of this species of Coprinus?" The constant association of the two, and the fact that no other species of Agaric grows in the Ozonium in our locality, strongly tend to this conclusion. I am not expert enough with the use of the microscope to trace the connection between the two, but Prof. Bresadola writes me "Dr. Penzig has a study in 1880 of Ozonium and Coprinus, and has reached the conclusion that the Ozonium is the mycelium of the Coprinus. I have examined your specimen and find nothing to confirm the opinion of Penzig. I find only points of contact, but I have not been able to trace the hyphae of Ozonium into the hyphae of Coprinus. However, I have reserved your specimen to study anew and compare it with the work of Penzig, which at this moment I do not have."

The article of Dr. Penzig (to which Bresadola refers), is found in Nouvo Giornali Botanico Italiano 1880, p. 132. It is in Italian, therefore unreadable (to us), but the conclusions evidently are that the Ozonium is the mycelium of Coprinus. I do not understand, however, exactly what the connection is. The radiating mycelium at the base of the plant (fig. 69), is white. Ozonium is always reddish brown. Rarely do we find specimens with the white mycelium so strongly developed as in the plant selected for illustration.

In regard to the identity of the species of Coprinus, we do not know under what name it appears in American literature. Such a common plant must have been noticed, and probably masquerades as a new species somewhere.

Dr. Penzig (loc. cited), describes it as a new species, Coprinus intermedius, and his description and figure is exactly the plant we have at Cincinnati, thus confirming the position that the Ozonium is the mycelium of this particular plant. Prof. Patouillard, to whom we sent specimens, determines it as Coprinus radians. It has but little resemblance to Cooke's figure, and still less to Massee's. In addition, Coprinus radians in English books seems to be a species that only occurs on plastered walls.

Fig. 69.
Coprinus radians.

The only reference I have found to the color of the spores, (save Penzig, loc. cited where they are correctly described as brown-black), is Massee "violet-black," ascribed to radians. The spores of our plant in mass when fresh and moist are *brown*, as brown as the spores of any Psalliota that ever grew (*). But in drying they turn darker, almost black. I have found in all books I have consulted that the spores of Coprinus are described as black, and no allowance is made for the inclusion of any brown-spored species.

258—DISTRIBUTION OF MITREMYCES.

We hope that everyone who meets specimens of Mitremyces growing will favor us with at least a few specimens of each species that we may study their distribution. There is something very mysterious about it. Mitremyces cinnabarinus is a common plant that we have found growing in the Alleghenies. There seems to be some sections, however, (as at Washington, D. C., and at Rugby, Tenn.), where the two other species grow, and Mitremyces cinnabarinus is not found. H. M. Caldwell, of Rugby, Tenn., has just sent us a fine lot of Mitremyces Ravenelii and lutescens, but does not find cinnabarinus.

In connection with the Mitremyces subject, we have received a letter from Mrs. M. S. Percival, of Rugby, Tenn., stating that she

(*) Those who work with Coprinus in this country know that we have two common species with *brown* spores. The plant under consideration and Coprinus pulcherifolius. But it is only when the spores are fresh and moist. They turn almost black when dry, hence it is not practicable to take them out of the genus Coprinus.

has noted specimens where the spore-sac protrudes through the mouth slits, thus confirming Massee's statement. We have never seen specimens.

We have received another consignment of Mitremyces Ravenelii, var. minor, from F. J. Tyler, and they are exactly as the previous lot —no connecting forms between them and the ordinary form of Mitremyces Ravenelii. We feel that in time this "variety" will be entitled to a specific rank.

259—TREMELLODON GELATINOSUM.

There are certain characters that in the Friesian system are associated with certain tribes or alliances of plants. Thus spines with the Hydnei; gills with Agarics; pores with the Polyporei; gelatinous texture with the Tremellae, etc. (*) Occasionally we find a plant combining two of these characters, and then, of course, there is a diversity of opinion as to its classification. Such a plant is the one named above. With the gelatinous texture of the Tremellae it has the spines of the Hydnei. Fries, Stevenson and others class it as a Hydnei; the modern writers, on aecount of its basidia, with the Tremellae.

Fig. 70.
Tremellodon gelatinosum.

The plant seems to be common in Europe, and has been illustrated a number of times. In this country it seems to be rarer. It is not mentioned in Atkinson's work, and we do not find it in the index of the first 27 reports of Peck. We are under the impression, however, that Peck has recorded it somewhere. We gathered it last summer on logs in Northern Michigan. There is no necessity of a detailed description of it here. With our illustration and the fact that it has the soft tremulose structure of a Tremellae and the spines of a Hydnum no one can mistake it. Our plant does not have the long stipe shown in illustration of Engler and Prantl.

260—NOMENCLATURE.

"I see you stand up firmly against the criticisms in reference to omission of authors' names. The evils you deplore for much of the egotistical practice I fully appreciate, and I can indorse all you say on that point. In spite of this, I am bound to say that my experience from day to day convinces me more thoroughly that endless confusion must result by the summary sacrifice of author citation. In the group

(*) In the new system that is being gradually evolved, based primarily on basidia structure, the prominent characters of configuration are only secondary in importance. It may be more scientific, but I am partial to the Friesian system. The simpler we make classification the more persons we will interest in the study, and the more facts and information will be published about the plants.

Minute anatomical studies are of interest, but only a comparative few have the patience or the skill to follow them out, and to make a knowledge of them the first requisite of classification debars a great number of workers.

that you study, comparatively limited in the number of forms, I can see no great inconvenience arising from the practice. I think, however, that the experience of others will be more in a line with that of my own. I merely say this word in passing, from which you may know that the matter is one of interest to me; most advantageous practice will doubtless result from the experience of many specialists. Your form must be desirable, and yet it looks to me as though it is a case of out of the frying pan into the fire.''—Extract from letter from Prof. W. A. Kellerman.

Our views on the nomenclature subject have been published so frequently it is not necessary to here repeat them. We believe, briefly, that personality in botanical science is the greatest weight attached to this study. More ''new species'' are published, more juggling of the names of old species are due directly to this cause than to any other. If the present plan is eternally followed, viz., that of describing plants in such an indefinite way that workers cannot tell from the *description* what the plants are, endless confusion must ever result. But if every botanical writer will make it his first duty to so describe and ILLUSTRATE his plants that others may know them, the matter will soon probably be rationally cleared up, the names of the plants then conveying the descriptive ideas they should. As things are now, chains of men are wasting time, either willingly or by protest, affixing their own names and personalities where the voice of science only has a right.

261—''CHARLEY'S'' VIEWS OF NOMENCLATURE.

We have on our list of acquaintances a celebrated ''bug hunter.'' We know him quite well, well enough, in fact, to call him ''Charley.'' Many a friendly discussion have we had with him on the subject of affixing personal names to the name of bugs and plants. Charley is a firm believer in it, but Charley is a candid fellow. He does not beat the devil around the bush and argue about the ''confusion that would result'' if we called things what they are, nor does he cite that great bugaboo, ''how are you going to tell what is meant when two men have called different objects the same name.'' He puts it on the only ground that is rationally at the bottom of the whole scheme, a personal ground. Authors like to see their names in print. He says: ''When I hunt up a new beetle and describe it, my name is put after it. *That is my reward.* If you take this away from me, what other returns do I get for all the trouble and labor I have gone to in the matter?'' If all our critics were as candid as ''Charley,'' we think we could soon show that the pursuit of science is its own reward, that it is not necessary to introduce a scheme of personal advertisements in order to study nature. While ''Charley'' and I do not agree on this point, there is one in which we are in close accord. It does my heart good to hear ''Charley'' cuss, (and Charley knows how to ''cuss'' with force) the men who have attempted to change all the names of butterflies. It seems strange to me that ''Charley'' does not see that this same personal incentive is the basis of all these name-changers, and that it is only a question of time when they will brush his name from all the bugs he has discovered.

MYCOLOGICAL NOTES.

BY C. G. LLOYD.

No. 15.

CINCINNATI, O. MAY 25, 1903.

262—NOTES OF TRAVEL.

WASHINGTON.

The only puff ball collection I know of in Washington is in the Herbarium of the department of Plant Industry, in care of Mrs. Flora Patterson. It is not very extensive; however, it presents some points of interest.

Calvatia rubro-flava was collected in the greenhouse of the Department of Agriculture at Washington. It seems to be a plant of cultivated ground only. I found it in a potato patch. Mr. H. B. Dorner finds it abundantly in the greenhouses at Lafayette, Ind. It has reached me from as far south as Alabama, (Bertolet), as far west as St. Louis, (Glatfelter). It does not appear to grow in the woods or in wild situations.

Simblum rubescens has been gathered at Washington by W. H. Scudder. This plant, originally described from Long Island by Gerard, I now know from three other locations: Nebraska (Bates), Kansas (Bartholomew) and Washington, D. C., (Scudder). Fischer claims it is the same as Simblum sphaerocephalum of South America. This point I hope to decide to my own satisfaction in Europe this summer. If it is, Simblum sphaerocephalum is now very badly figured.

C. L. Shear has a commendable habit of picking up all the puff balls he finds in his travels. As he has spent many months in the western section, I was interested in looking over his specimens. I was glad to find among them a Catastoma which is new to me and which is the fifth species I now know to grow in this country. Mr. Shear kindly gave me some type material of the two species of Gastromycetes he has recently described. Scleroderma pteridis seems to be based chiefly on habits. It grows attached to the rhizoma of Pteris at a depth of two or three feet below the surface. As it does not seem possible that it can reach the surface, it is probably truly subterranean. I do not think, however, that herbarium specimens can be distinguished in any particular from unopened Scleroderma Geaster. Secotium Arizonicum has many points of resemblance to our common species, S. acuminatum. Dr. Hollós would undoubtedly so refer it as its spores are the same. Had specimens been sent me I should probably have so named it, though it does seem to dehisce in a different manner and the columella does not reach the apex. If these differences are constant, I think the plant is entitled to specific rank.

I had the pleasure of meeting a number of botanists at Washington. F. W. Coville, Chief of the Department, who was very kind to me, as were W. H. Evans, A. S. Hitchcock, Wm. R. Maxon, P. L. Ricker, R. H. True and others. Some of them are not particularly interested in "puff ball" work, though all seemed to take an interest in the stand I have taken on the nomenclature question, and I was surprised and gratified to find they had read after me so closely. I must admit, however, that not one of them (nor any other botanist I have met) is willing to go to the extreme of omitting personal names after the names of plants. All admit the load botany is carrying in the way of synonyms; all deplore the kind of work that is largely done; some even agree with me in ascribing to personal interest much of this work, and yet not one is willing to cast off the the tap-root of the whole trouble.

ALBANY.

It is gratifying to find Prof. Peck much more pleasantly located than when last I saw him. Then he was crowded in a little hall-way in the Capitol, now he has a large room in Geological Hall where he can conveniently keep his specimens. The "puff balls" of the collection are ample in quantity and there is no trouble in arriving at Prof. Peck's views on each of the New York species. They are mostly kept in trays in a show case for exhibit purposes. But a single specimen of Secotium acuminatum has been found in the state of New York. Mitremyces cinnabarinus occurs but rarely in the southern section; Calvatia caelata has been collected in the state but once and the specimen is not so strongly marked as the western plant with which I am familiar. Calvatia craniiformis is not represented at all as a New York species in Prof. Peck's collection. This is surprising to me as it is abundant about Cincinnati, and I am quite sure I have it from States farther east than New York. The "puff ball" collections, other than New York specimens, are not very numerous. I saw the type of "Secotium decipiens" and it is as I have taken it to be, Gyrophragmium Delilei of Europe. The type of "Battarrea attenuata" has been lost and hence I cannot say whether or not it is Dictyocephalos curvatus. From the description, I have thought it to be that plant. From Prof. Peck's memory of the plant as he kindly described and sketched it, I think it is not. It is certainly unfortunate that Prof. Peck should have described as a new species a plant, which in the absence of the specimen, must always remain a mystery. It is not even certain whether or not it is a Battarrea. I think the record of Clathrus cancellatus from New York is very doubtful. The only certain specimens I know from this country are from Florida, in the museum at Harvard. The specimens sent Prof. Peck from New York were all broken in little pieces. At that time Prof. Peck was not acquainted with Clathrus columnatus, our most common species, and referred the fragments to Clathrus cancellatus, the only species of which he then knew. It is impossible now from the little that remains in the herbarium, to speak positively, but the probabilities are that it is Clathrus columnatus.

MIDDLEBURY.

Two of the pleasantest days I have spent were in a quiet visit with Prof Burt at Middlebury, Vermont. I am very strongly impressed with Prof. Burt's method and the thoroughness of the work that he is doing in the Thelephoraceae. The paper will probably appear within a year and will be a credit to American Mycology, and the most important contribution ever written in this country. We all admire thorough work and it is a pleasure to praise a man who goes to the bottom of his subject. One who has not seen Prof. Burt at work, has not seen the hundreds and hundreds of mounts representing type material from all the leading herbaria, can ever appreciate the vast amount of patient labor that has been devoted to the subject. I do not believe that Prof. Burt is tinctured with the modern name-changing mania. I believe he will employ in the main the principles of naming in general use. And it would be a boon to Mycology if the names he selects are taken as the *names of the plants,* and thus let the antiquarian investigations as to this order end with this paper. It seems to me a shame that a man who takes up the study of a subject in Mycology, as Prof Burt has taken up the Thelephoraceæ, must spend ten times as much time solving puzzles, finding out what others have called plants, as he does studying the plants themselves.

CAMBRIDGE.

It was with some misgivings that I made my bow at Harvard and met Professors Farlow and Thaxter. I did not know how these college bred men, who had lived and breathed all their lives in the cultured and learned atmosphere that permeates everything at Harvard, would receive a country bred visitor from the west. It was gratifying to be made to feel at home and in addition to have all the priceless treasures of the Harvard collection placed at my service. I spent a week in the museum, mostly studying the Curtis collection of Gastromycetes, which is of the greatest value as representing Berkeley's views of American species. Prof. Thaxter devoted considerable time to showing me specimens and drawings of the Laboulbeniaceæ and opened my eyes upon a new world. I have, of course, known casually of the work he was doing in this order, but I did not realize the beauty and variety of the species nor the fascination of the work. Prof. Thaxter is practically exploring an unknown world. He is not hampered with the debris left by previous workers, nor does he have to spend most of his time unraveling puzzles of man's making. He can devote all of his inquiries to the secrets of Nature, and Science can be congratulated that the initiatory work is in such capable hands. So much of my time at Cambridge was taken up with the study of the Curtis collection that I had little opportunity to meet the mycological workers, so numerous in the vicinity of Boston. I took dinner with Prof. Hollis Webster at the Harvard Union. I am afraid most of Prof. Webster's time has been devoted lately to matters not strictly mycological. In fact, his engagement to a charming young lady has been recently announced, and we can all know how pressing the demands of these matters are on a man's time Of course I could not leave Cambridge without calling on my old-time friend, Walter Deane.

THE CURTIS COLLECTION.

I have looked forward to a visit to the Curtis collection in order to solve several problems that have always confronted me in the study of American "puff-balls." Curtis was one of the earliest American mycologists, and sent most of the material on which Berkeley based his account of American species. With the aid of the specimens preserved in the Curtis collection we can learn definitely Berkeley's views, for Curtis divided each collection, retained part in his own herbarium, sent part to Berkeley numbered to correspond, and Berkeley cited these numbers. In addition Berkeley sent to Curtis many plants that he had received from Lea, Sprague and many other American collectors. My opinion, as stated following, is formed from an external examination of the specimens. I did not make microscopic mounts as it would have involved more time than I could spare, and I feel so familiar with most of our species and their microscopic features that I am willing in most cases to risk my judgment on an external examination. In a few instances, however, a spore study will have to be made before positive conclusions can be reached. Morgan and Peck have both printed opinions about Berkeley's determinations, but as neither has seen the specimens, a number of their conclusions are erroneous.

HYDNANGIUM RAVENELII.

I have known this plant for some time though I did not know this name for it. Mr. Bertolet sent it abundantly from Alabama, and Prof. Earle had previously given me specimens from the same locality. It is, Mr. Bertolet writes me, the most common Hymenogaster of the south. The spores are reticulate-tuberculate, more reticulate than any other species. None of my European correspondents to whom I have sent the plant have recognized it, and it was proposed to call it "Hydnangium reticulatum." I am glad I did not rush into print with this "new species" when I received it two years ago, as it is one name saved from the grave-yard. Berkeley published it as a variety of H. Stephensii, but I do not question its distinction from that species.

"SCLERODERMA TEXENSE."

On page 69 of Mycological Notes I made the statement that it (Gyrophragmium Delilei) was described from Texas as Scleroderma Texense, afterward changed to Secotium Texense, and still later to Gyrophragmium Texense." That statement is erroneous. The plant that Berkeley described as Scleroderma Texense has no resemblance to what he later described as Secotium Texense, nor does he so state. It was I who was confused. "Scleroderma Texense" now appears to me to be Scleroderma bovista, and "Secotium Texense" to be a small-spored form of "Gyrophragmium Delilei."

LYCOPERDON CALVESCENS.

Without a spore examination it is difficult to say how this plant, cited by Berkeley (Wright 6366) is now known. It is not L. cruciatum (L. separans) as Morgan surmises. The spines are very similar to those of L. pedicellatum, but Berkeley's spore description removes it from that plant. I think it is "L. echinatum" of Peck's paper, afterward changed to L. Peckii by Morgan.

LYCOPERDON PULCHERRIMUM.

There is quite a problem in selecting a name for this plant. The specimen on which Berkeley based the description has large, purple, rough spores. Berkeley described it as having small, smooth, olive spores. Massee states that the spores have changed since Berkeley worked with the specimens but that does not appeal to me as being possible. I rather think Berkeley was careless, and was more interested in adding his name to a "new species" than in giving a good description of the plant. It is a question to me whether such work in a case like this has any claim to recognition. Prof. Peck had no reason to think when he met the plant that Berkeley had described it and can not be blamed for re-naming it L. Frostii. Everything being equal, I personally, would use Prof. Peck's name, but there are other considerations. L. pulcherrimum is particularly appropriate, as it is the "most beautiful" species we have, and I have always contended that plants as well as men have rights in the selection of names. Besides, since Trelease correctly interpreted Berkeley's specimen, and Morgan accepted and published it, the name is somewhat established. I rejoice, however, that I do not have to add to the name of this beautiful plant the name of the man who so strongly misrepresented it.

LYCOPERDON DELICATUM.

I am glad to locate this name as it has always been a mystery. Morgan had no conception of it as is evident from his paper. From Berkeley's description I have thought it was possibly Calvatia rubro-flava and others have thought the same, as I have seen specimens of Calvatia rubro-flava so named. *The plant is our old, familiar friend, Calvatia craniiformis.*

LYCOPERDON CRUCIATUM.

The specimen (1846, Olney, R. I.) which Berkeley cites is as we now know the plant, and I have always claimed that Berkeley referred our American plant (separans of Peck) to the European species. (Cfr. Myc. Notes, p. 83). That Curtis had no idea of the species is evident, as we find plants of his naming on his sheets of Wrightii and also on gemmatum sheet. Among those on the Wrightii sheet is a specimen from Prof. Peck, and Curtis undoubtedly named L. cruciatum as Wrightii for Prof. Peck. This is a clue to Peck's subsequent treatment of cruciatum as a variety (separans) of Wrightii.

LYCOPERDON CURTISII AND LYCOPERDON WRIGHTII.

Neither of these plants are cruciatum, with which they have both been confused. They look very much alike externally, but as I do not know their internal difference I can not say. I would say, however, that the plant with which I am so familiar, which Morgan has called Curtisii and has truly characterized as having *hyaline* capillitium, is represented by the specimen of Wrightii rather than of Curtisii. The latter seems to me to be more yellowish than the plants we now know under this name.

"TYLOSTOMA MEYENIANUM,"

I can not see how any one who has seen these specimens in the Curtis collection can have any doubt as to their identity with Chlamydopus Meyenianus. (C. clavatus of Spegazzini, cfr. Myc. Notes, p. 134.)

"BOVISTA NIGRESCENS."

The specimen from Lea is Bovista pila, confirming statement on page 116, Myc. Notes. Four other specimens on this sheet in the Curtis collection are B. plumbea.

MITREMYCES RAVENELII, VAR. MINOR.

Specimens seem to me to be young Ravenelii rather than the small plant I have so called. (Cfr. Myc. Notes, p. 127.)

CYATHUS WRIGHTII.

Miss White's figure of this plant is very misleading, and I should say very inaccurate. The abrupt swelling at the base, which she shows as the shape of the plant, is simply a ball of adhering dirt.

CORYNITES CURTISII.

I fully agree with Prof. Burt that the specimen is the same plant Morgan subsequently described, correctly illustrated and named Mutinus bovinus. I do not like to use Berkeley's name because he so badly figured it, nor Morgan's because he so badly selected it, and so I will have to fall back on priority and use Montagne's name, Mutinus elegans.

CAULOGLOSSUM TRANSVERSARIUM.

There are four collections in the Curtis herbarium which show that it was not then considered a rare plant in the south. Some were originally labeled "Clavaria pistillaris." One is labeled "Secotium transversarium," B. & C. I think it was never published under the latter name.

SECOTIUM TEXENSE

I think is only a small-spored form of Gyrophragmium Delilei, and should be called Gyrophragmium Delilei, var. Texense.

PHALLUS RAVENELII.

Little can be told from the old specimen that remains, but it is accompanied by a full description by Ravenel (written to Curtis). If Berkeley had used these notes instead of his brief synopsis which described nothing, it would not have remained for Prof. Peck to give us the first real account of the plant. If I believed in adding names of persons to plants as "advertisements" I would add Peck's name and not Berkeley's to this plant.

PHALLUS RUBICUNDUS.

There are eight collections in the Curtis herbarium, all so old that really nothing can now be told about them save that Curtis did not consider it a rare plant. A note from Ravenel to Curtis regarding specimen (986 quoted by Berkeley) shows that Ravenel was familiar with the plant having a *red* stipe as its salient feature.

GEASTER SACCATUS.

The specimen that Berkeley cites shows that he included in saccatus the large plant we now have as triplex. This is in line with my own conclusions, (cfr. Myc. Notes, p. 143) that triplex is the large, robust, more perfectly developed form (revolute) of saccatus.

GEASTER FIMBRIATUS.

As there has always been a mystery to me about the American citations of Geaster fimbriatus, I was glad to see these plants of Berkeley and to be able to identify them positively as what we now know as Geaster velutinus (see Geastrae, p. 33). That it is Geaster fimbriatus of Fries, however, I very much doubt, as I have never seen this plant from Europe and all of my foreign correspondents concede the validity of our Geaster velutinus. But I was pleased to make another discovery in the Curtis collection. Geaster radicans (see Geastrae p. 31) as shown by the fine specimen, cited by Berkeley, is the perfect *fornicate condition* of Geaster velutinus. This plant which is quite common with us is generally a sessile, saccate species, (see Geastrae figs. 62 to 67) and has become known as Geaster velutinus. In the extreme south it grows larger and more robust, the fibrillose layer arches up over the mycelial, and the plant becomes truly fornicate. In this condition it has been called Geaster radicans, which is a "prior name." if you wish to use a name based on the unusual rather than the usual condition of the plant. If you will compare figs. 57 and 63 of the Geastrae pamphlet you may question if they are the same plant. There is no doubt now in my mind on the subject.

GEASTER FORNICATUS.

Specimen (2301) cited by Berkeley is typically G. coronatus as I have illustated it.

There are a few other things that I have learned from a study of the Curtis collection, but the foregoing are the most important.

NEW YORK.

I had only time in New York, a couple of days before sailing, to write up these notes and make a short visit to the New York Botanical Garden. Professors Britton, Underwood and Earle are on a collecting trip to Cuba. I met Daniel T. Macdougal, who had just returned from Mexico; J. K. Small, busily engaged in his work on the southern Flora. now near completion; M. A. Howe, who is making a special study of the sea weeds; A. D. Selby, Wooster, O., who is at

the Garden investigating latex in plants; J. H. Barnhart, editor of the Torrey Bulletin and W. A. Murrill, who is making a special study in the Polyporii. The signs on the inner and outer doors of the Museum Building impress me as especially appropriate to the New York Garden – "Push" and "Pull." Anyone who comes in touch with the active, energetic men at the head of the institution and notes what they have accomplished, will be impressed with the amount of "Push" shown on every hand. When you see their magnificent buildings, gardens and glass houses, finer I think, than I have seen at Kew or elsewhere, and stop to consider the cost, it is likewise evident that they have a strong financial "Pull."

AU REVOIR.

I go direct to Paris and will locate at No. 107 Boulevard St. Michel. My readers will learn shortly the results of my study of the Gastromycetes in connection with Prof. Patouillard.

263—"GEASTER COLUMNATUS"=MYRIOSTOMA COLIFORME.

By N. PATOUILLARD.

(*Geaster columnatus* Lèv. Ch. du Mus. in Ann. Sc. Nat. (1846) p. 161.)

Cette espèce doit être réunie à *Myriostoma coliforme* comme simple synonyme. En effet, tous les caractères, tant extérieurs qu'intérieurs, sont exactement les mêmes dans les deux plantes. La déhiscence du péridium interne de *G. columnatus* a lieu par *plusieurs* ouvertures situées autour du sommet et non par une ouverture unique. Les spores sont de la même dimension et ont les mêmes verrues que celles de *M. coliforme ;* le capillitium est également composé de filaments *libres*, atténués aux deux extrémités, non rameux, mais montrant souvent des protubérances courtes, analogues aux épines du capillitium de beaucoup de *Mycenastrum*. La gleba, dans les deux cas, est traversée par des prolongements dressés, rameux, stériles partant de la portion inférieure de la paroi du péridium interne et s'élevant dans l'intérieur de la cavité générale.

Par le caractère du capillitium de filaments libres, le genre *Myriostoma* s'isole nettement de *Geaster* et se rapproche de *Mycenastrum* et de *Bovista*.

264—HYPOCREA LLOYDII,

When this species was described, Prof. Atkinson called our attention to the fact that the plant had been called in America, Hypocrea alutacea. (Cfr. Myc. Notes, p. 87, 99 and 110.) Prof. Patouillard tells me that in his opinion Hypocrea Lloydii as described and illustrated on page 87 by Bresadola is a good species and very different from H. alutacea. He has shown me the type specimens of Tulasne and many others from Europe and it does not seem possible to me that the two plants are the same.

MYCOLOGICAL NOTES.

BY G. G. LLOYD.

No. 16.

CINCINNATI, O. MARCH, 1904.

265—NOTES OF TRAVEL.

PARIS.

As I have remained in Paris for three months, trying to get a little practical knowledge of the French language, one can hardly call it "traveling." The mycological interest of Paris, as indeed of France, centers around Prof. Patouillard, who is conceded to be among the best informed men on the subject in Europe. As I had the pleasure of meeting him on a previous visit to Paris, it was not like meeting a stranger. I have seen much of Prof. Patouillard since this visit to Paris and it was a great pleasure to me when I became able to talk with him a little (without the aid of an interpreter) in "broken" French. He has been very kind to me. The Lycoperdons of Europe have always been and are yet a puzzle to me, but many points have been cleared up through the information that Prof. Patouillard has extended. Prof. Patouillard is a man I should judge about fifty years of age. He resides with his family (wife and two young lady daughters) at Neuilly which is just outside the walls of Paris. A pharmacist by profession, he is confined rather closely to his business, but each Tuesday and Saturday he is to be found at the museum in Paris studying fungi, which is his manner of recreating. Monsieur Hariot, the curator of the museum of cryptogamic botany at Paris, is a most genial and accommodating man. Never have I had better facilities to work than at this museum. The key to the museum was literally placed at my service with full permission to study, photograph and make spore mounts of the many rare specimens in the museum. As the museum contains the specimens of Tulasne, Corda, Léveillé, Montagne, as well as specimens sent to them by Berkeley and others particularly by Vittadini, it is needless to say they are of the greatest historical importance. I shall always be grateful for the many courtesies extended to me by Monsieur Hariot.

Monsieur Rolland resides at Neuilly, a close neighbor to Prof. Patouillard. *Comme moi* he is a "*celibataire*," a man of means, evidently, who finds his amusement in photography and mycology. He has the finest private library on mycology I have ever seen with possibly one exception, that of Prof. Farlow at Cambridge. At a dinner given by Monsieur Rolland I made the acquaintance of Monsieur E. Boudier. Monsieur Boudier, now well advanced in years, is a well known writer on mycology in France. His specialty is the Discomycetes, but he is equally at home with the Agarics and, indeed, all the fungi of France.

PERSOON.

It is not generally known that Persoon spent the latter part of his life at Paris. There are but few traces of him here, for he lived in poverty and local obscurity. There are a few scattering specimens of his determination in the herbarium of Montagne,* and an article in Desvaux' Journal de Botanique. These are all that remain to mark the local habitation of perhaps the greatest mycologist who ever lived, the father of the science. His bones for a short time lay in an obscure grave, but as the interment of the poor at Paris is only temporary, they have without doubt long since lost their identity in the accumulation of these grewsome relics in huge piles in the catecombs. It is due to the efforts of Fée that the final years of Persoon's life were not passed in actual misery, and that we have the details of his life at Paris. He published a biography of Persoon in 1846 in Italian which was translated into French in the Bulletin de Botanique de Belgique, 1891. As it is to me most interesting reading, I have extracted from it very liberally.

Persoon was born in 1755 at Cape Good Hope, South Africa, at that time a colony of Holland. His father was Dutch, his mother a Hottentot.† Little is known of his childhood, but having lost his parents at an early age he came to Germany where he lived a roving life in several of the university cities and published his early works including his "Observationes Mycologicæ" and his "Synopsis Methodica Fungorum". The latter is the first really systematic account we have of fungi, and the foundation on which Fries built the superstructure. Persoon came to Paris, we judge, about the beginning of the century, for his last published work in Germany was 1801, and the first in Paris was 1803. His reputation had preceded him and he was at first favorably received, but it was not long until he found himself abandoned and alone in a truly miserable condition, for he was so poor that he is said to have suffered for the common necessities of life. His biographer states that the French might have pardoned him his poverty, but he had another defect "toward which the French are inexorable". He was extraordinarily ugly. We do not reproduce the details of his physiognomy, and we believe no portrait of him exists. His contemporaries at Paris, however, shunned him and he lived here in almost complete isolation notwithstanding his reputation as an author was well known especially in Germany where he was justly considered the "prince of mycologists". He often received consignments of plants from correspondents who naturally supposed him "rich and honored" living as he did in the wealthy city of Paris. These were usually consigned to some bookseller, for Persoon had not the slight funds necessary to pay for their transportation. Fée relates the following. "One day a young bookseller received a little package addressed in Latin to "Monsieur Persoon, Very Learned and Very Illustrious Prince of Mycologists, rue des Charbonnier 2". The bookseller knew the Latin and while he could not understand why such an illustrious and noble

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* Two of the Gastromycetes, Lycoperdon perlatum and Calvatia caelata.

† The biographer does not state distinctly, but we presume a native, hence Persoon must have been of mixed blood.

personage chose faubourg Saint Marceau for a place of residence, he thought to avail himself of the package as a means of making his acquaintance. Rue des Charbonnier is a little street in what was then the poorer district of Paris, No. 2 a tenement house. Having been directed to the sixth story by a "merchant of wine"* and having climbed what seemed to him an interminable, bad† stairway he knocked on the door indicated. It was cautiously opened a few inches, a shabbily dressed individual demanded his business, and finally admitted him to the lodgings. It was a little room under the roof.‡ badly lighted but too well ventilated by numerous cracks around windows and doors, and although it was winter there was no fire. A bed and a chair or two, some rough tables covered with packages of plants, books and specimens—such were the surroundings in which this genius worked. The bookseller wishing to flatter him addressed him by the title on the package as "My Prince", but Persoon thinking he was making sport angrily exclaimed "Yes Prince, and here are my subjects. There are some dried between sheets of paper and here are some preserved in alcohol. There are some who will be poisoned with corrosive sublimate, and others who await a burning fire. Instead of saying "Prince" you had better say "Tyrant", and a tyrant more terrible than Denis, because at Syracuse it at least was warm, and I freeze at Paris." So saying he pushed his visitor to the door, and he, thoroughly alarmed at the strange interior, beat a hasty retreat." Fée (1825) found Persoon in the same reduced and humiliating position. He interested himself to ameliorate his condition and solicited the aid of some wealthy friends. Persoon rejected the project stating, "The sentiments of dignity which have always served as a rule for my conduct should exist with all men of science. It would displease me to receive aid in any manner which later might cause me shame for having accepted it. The fact might be distorted to depreciate a man whose name is cited in the scientific world, and I would remain disconsolate." Shortly after this Fée made the acquaintaince of a man in close relation with the Prince of Orange of Holland, and as Persoon was really a Dutch subject, having been born in a Dutch colony, the government of Holland was solicited to acquire the herbarium in lieu of an annual pension of eight hundred florins (about three hundred and fifty dollars). "Monsieur Fagel, then ambassador at Paris, visited the herbarium and placed seals on the boxes and packages as a sign of having taken possession. Poor Persoon was humiliated at this operation but he dare not complain." The herbarium was shipped to Leyden, but Persoon continued to live at Paris, in affluence compared to his previous existence, until his death. February 17, 1837. "He died in isolation. The hand that closed his eyes was that of a stranger, and no friend was at his death bed to mourn for him. The botanists at Paris were perhaps ignorant

* As the Parisians call their saloon keepers.

† We can not use the ordinary English word "rickety" applied to bad stairways. for here they are usually made of stone, and however bad they may be they are not rickety.

‡ The same house stilll remains near the Gare de Lyon. It appears from the outside like ten thousand other houses in Paris, for all are built on the same plan. It is five stories with a mansarde like all houses. and in this "mansarde" (garret we would call it) Persoon lived I have made inquiries of the "concierge", but no tradition even of Persoon is known in that neighborhood.

of his death. No voice eloquent was raised over his mortal remains, obscurely abandoned to the earth, and his coffin was followed to the grave by not even the unique and last companion of the poor." Thus lived and died perhaps the greatest genius mycology has ever known, for Persoon was a builder. He began the work with practically nothing and left a system, of which others have availed themselves with much too little acknowledgment.

SWEDEN.

The lower part of Sweden, as much as I saw of it during the few hours of daylight that I passed through it, seems to be a fertile, sparsely wooded country, well cultivated. The portion around Stockholm, where this summer I spent three months, is mostly rocks and woods. There is but little land suitable for cultivation, the greater portion being in natural woodland. Lumbering is an important industry, but the Swedes do not as we do, cut and slash everything that grows, leaving a desert waste in the trail of the woodcutter They select for lumber only such trees as have reached a suitable size, leaving the remainder to grow. The soil is usually very scanty, but the ground and rocks are covered with a dense carpet of Sphagnum, the natural home of Agarics. Sweden is preeminently the Paradise for the mycologists. With an abundance of woodland, a cool, moist climate such as Agarics like, I think there is no other country where fungi grows so abundantly. I was fortunate in being there during an unusually wet season. It rained nearly every day, certainly every other day, and I could take a basket any day and collect in an hour more species new to me than I could possibly photograph, and work with the remainder of the day. During three months my list of Agarics reached about 450 species and I had no time to work with Polyporii, Thelephoraceæ and other orders which abound.

L. ROMELL.

I am under many obligations to Mr. Romell. My time was so taken in collection, photography, etc. of specimens that I had little time or inclination to study them. I hastily ran over the descriptions in Fries, labelled them as I thought they were if I made them out at all, and sent the specimens to Mr. Romell who was kind enough to advise me regarding their proper classification. It was surprising to me how many species can be satisfactorily determined in Sweden with a little work. I believe that one who will go to Sweden for several seasons, study the species in the light of Fries look up illustrations, etc., will arrive at satisfactory conclusions about almost every plant he finds as Mr. Romell has done. Some of the mistakes I made were amusing to me, and some were instructive. For instance, when I found a large, white Clitocybe which I could not locate, I was surprised to learn that Fries had included it in Paxillus (giganteus) for its spores are *white*. The next species I found with the gills readily separable from the hymenophore. I looked in vain for it in Paxillus and learned that it was Clitocybe gilva. Now, I do not know whether these species should be called Clitocybe or Paxillus, but I think they should be put in the same genus.

Mr. Romell is one of the men one can like through and through. He is as full of information regarding the fungi as an egg is of meat; modest, unassuming, he pursues the subject only from the love of acquiring knowledge. He is not engaged in any scheme of publication of "new species" or in juggling with the names of old.

Mr. Romell has a boy that was a marvel to me. A lad perhaps twelve years old, he can tell the Latin name of every Swedish flowering plant. No doubt he inherits much of his aptitude, but I think he is not an exceptional case in Sweden. Botany, there, is a study required in the schools, and it is practical knowledge that is required. It is not the farce it is in the high schools generally in the United States. Is it any wonder that a nation that instills in the mind of every school boy a love of natural history should produce such men as Linnaeus and Fries?

ELIAS FRIES.

It is certainly no exaggeration to say that Fries was the most learned mycologist of his time, especially with regard to the Agarics. Fries made mistakes, no doubt, as everyone makes mistakes, but the fact remains that he made a close, practical study of Agarics for seventy years, in a country where they abound. He gave the world the result of his labors in a concise systematic manner; first acquiring a knowledge of his subject, and then describing his plants in the only way that plants should be described to be intelligently recognized, by contrast of the essential points of difference.

The result is that Fries' species are *facts*, they are tangible, they can be recognized. They are not, as alas is the case with too many of our modern "new species," put forth with a few grains of truth, perhaps hidden in a mass of unimportant and confusing verbosity. Fries, I judge from the stories that still persist, was a positive man. He knew the Agarics as no man probably ever knew them before, and he was conscious of it. His method of work is probably the best—to study and make notes of the plants in the woods where they grow—but, unfortunately, he often neglected to keep specimens of the fleshy fungi and depended almost entirely on his notes. The plants that grow in Sweden to-day do not all of them conform strictly to Fries' descriptions. There are minor discrepancies due probably to the fact that when he came to publish he found lapses in his notes which he supplied from memory or from illustrations that he referred to the species.* But in spite of these minor discrepancies Fries gave the world the only reasonably complete and systematic work on Agarics that exists. I believe if the efforts of mycologists to-day were put forth chiefly to find out what Fries' plants are, then to adopt in the main the names he used, to correct the minor faults of description and classification he made, and to better illustrate his plants, much more rapid progress would be made toward a knowledge of the subject. With exception of the spores Fries did not lay much stress upon the color. He required that his species must have some marked

*It is difficult otherwise to explain a number of obvious errors such as the spores of Calocera viscosa are "white;" those of Lepiota naucina are "globose;" the gills of Russula lutea are "narrow" etc.

difference other than color. While it is undoubtedly true that many species vary in wide latitude as to color, I can not see why if two plants are entirely distinct as to color, and do not shade into each other, they are not good species.

Fries is buried in the cemetery adjoining the University of Upsala. His grave is marked with a massive slab of granite and bears the simple words:

ELIAS FRIES,
Född 1794, Död 1878.
Med maka och barn.

FRIES' DRAWINGS.

Notwithstanding the frequent references in Monographia to plates of Agarics ("Nostra in Mus. Ac. Sc. Holm.") Fries was no artist and did not himself leave any drawings on the subject. The plates referred to are preserved in the Botanical Museum of the Royal Academy of Science at Stockholm. They were made by artists employed for the purpose, and Fries "approbavit" them with his autograph signature. I know nothing of the subject myself, but I am told that, while many of the plates give a good idea of the species they are intended to represent, there are others which it is difficult to reconcile with the published works and some have evidently wrong names. The plates were made successively during a number of years so that some are of later and others of an earlier date. In the course of time Fries' views as to some species probably changed with his increased knowledge. Besides, although Fries possessed an unusual capacity, it must have been impossible even for him to keep *all* his species in fresh memory all the time. And sometimes the specimens, from which the drawings were made, did not perhaps exactly agree with the specimens he had in view when making the descriptions, but, for want of proper types, were yet admitted as representatives of the species in question. As a rule the plates are well done, but some of them seem to be exaggerated or crude and seem to fail in plasticity. There were several artists employed on the work and some were much better than others. The Royal Academy of Science at Stockholm supplied the funds for the purpose, which explains why the plates are to be found in that institution. Fries never lived at Stockholm except when he attended the sessions of the Swedish Parliament ("Riksdag") of which he was for a time a member.†

THE MUSEUM AT UPSALA.

The specimens in the museum at Upsala are in better condition than the specimens in any museum I have yet seen. Very carefully enclosed in envelopes they are attached to heavy sheets of paper, and each species is kept in a cover, alphabetically arranged. In addition to these there is a very large collection in glass jars where they are preserved without pressing. I was under many obligations to Dr. Oscar Juel, the courteous director of the museum, for full permission to work with the specimens. To me, of course, the chief interest lay

†Viz: in the years 1844-5 and 1847-8.

in the specimens of Fries' herbarium, which are all marked "Ex herb. Elias Fries". There are very few specimens there now that Fries had when he wrote his "Systema". In his early days Fries evidently took very little care of his specimens, and the "types" of many of Fries' species of Gastromycetes do not exist. The truth is that Fries' work on the Gastromycetes in "Systema" was chiefly made up from publications and not from his plants. This is evident also from his work, for he states at that time he had only collected three species of Geaster, and his descriptions contain many errors that he drew from inaccurate figures. I do not know but that this is fortunate for most of Fries' "types" are the figures that he cites and these figures can be as accurately known today as when the species were described. The greater part of the specimens in Fries' herbarium today are specimens sent to him after the publication of his work, specimens named from his work by his correspondents and sent to him and placed in his herbarium as received. They are badly misnamed according to Fries' own publications, but I do not feel that Fries should be held responsible for the errors of his correspondents, though of course putting them in his collection without correction in a manner endorsed the determinations. After the appearance of his "Systema" (1829), Fries apparently paid no further attention to the Gastromycetes but devoted his whole time to the Agarics.

UNFINISHED WORK.

The objects of our trip to Sweden were not fully accomplished. While in Washington we were solicited by a lover of the moss family to hunt up when we reached Sweden a certain Swedish gentleman who is playing havoc with the moss names by some system of name juggling and to murder him in the interest of science. We regret that opportunity did not present to carry out this laudable design.

266—UN FESTIN MYCOLOGIQUE.

Le 20 Juin dernier, se trouvaient réunis. autour de la table hospitalière de M. Rolland, à Neuilly: MM. N. Patouillard, E. Boudier, notre aimable hôte et l'auteur.

Ce fut un festin vraiment mycologique. Des champignons ayant été servis, la conversation tomba naturellement sur ces cryptogames. J'éprouvai un grand plaisir à entendre discuter MM. Patouillard et Boudier. Il n'y a pas d'hommes en France, et peut-être dans le monde entier, qui connaissent ce sujet aussi à fond que ces messieurs.

Ce sera pour moi un souvenir charmant, que ce dîner mycologique chez M. Rolland.

267—N. PATOUILLARD AND P. HARIOT.

I have seen a great deal of both these gentlemen during my five months in Paris. and they are both men whom the better you know the better you like. Both have been unusually kind to me and both have learned to comprehend my spoken French, for be it known that I speak a French largely my own, and it is not every Frenchman who knows his own language as I speak it. It was nevertheless a great gratification when I became able to converse freely with them.

268—E. BOUDIER.

Towards the close of my stay in Paris, after I had learned enough French to make myself understood (in a broken way) I had the pleasure to déjeuner at the invitation of Monsieur Boudier in company with Prof. Patouillard. Monsieur Boudier is one of the grandest men that mycology claims today. Well advanced in age he has devoted forty years of close study to the fungi of France, especially the Agarics and the Discomycetes. He has prepared a series of plates of the fungi of France, which in beauty, in accuracy, in minute technique are unrivalled by any that exist today. Compared to them the usual published plate of Europe is a cartoon. I do not know what provision has been made for their disposal in the future, but I hope they will reach some institution where they can be of use to future students, and where they will be duly appreciated and cared for. The expense will probably preclude their publication, for Monsieur Boudier tells me he has had an estimate made and finds it would cost over 150,000 francs to reproduce them exactly. In my opinion it were better they were never published than to be issued by the cheap machine process by which plates are often printed. E. Boudier is a name practically unknown in America, but I am happy to say it is a name that is duly known and honored in France.

269—LE GENRE LYCOPERDON EN EUROPE.

Je crois qu'il y a une grande confusion au sujet des Lycoperdon d'Europe. Si on veut prendre les rapports et les synonymes donnés dans Saccardo, Massee, Quelet, Fries et Vittadini et essayer de les mettre d'accord, on arrivera à la même conclusion.

Il est impossible à celui qui, en Amérique se baserait sur cette littérature si embrouillée de faire une comparaison entre les plantes d'Amérique et celles d' Europe. Si un travail de ce genre a été fait ce ne peut être qu'un travail établi sur des suppositions.

Il ne peut y avoir aucune certitude dans la nomenclature des Lycoperdon d'Europe si celle-ci est basée sur l' "antériorité". Les premiers noms ont été donnés d'après les dessins de Vaillant, Bulliard, Micheli et Schaeffer, quelquefois assez justes et caractéristiques mais souvent très mal exécutés. Les mycologues qui s'occupent de ces questions n'auront jamais la même opinion sur l'attribution de beaucoup de ces dessins et par conséquent ne seront pas du même avis sur les noms qui leur ont été donnés. C'est une grande faute de s'en rapporter aux vagues données du passé pour choisir les noms que l'on veut attribuer aux plantes. On arrive finalement à un moment où deux savants ne pourront plus s'entendre, surtout, quand il s'agit d'un genre comme celui des Lycoperdon, quand les caractéristiques de chaque espèce se reconnaissent aux spores, capillitium et voile inconnus à ces travailleurs de la première heure qui ont donné des noms et qui se sont surtout basés, dans chaque variété, sur la forme, la taille et la couleur, caractères n'ayant pas d'importance déterminée.

Quand je vins en Europe au printemps dernier. je demandai à tous ceux qui avaient recu mes publications de m'envoyer tous les spécimens qu'ils pourraient trouver et je suis reconnaissant aux personnes dont les noms suivent qui ont accédé à ma demande: Réverénd Torrend, L. Romell. F. de Aranzadi, M. Barbier, Otto Jaap Madame Schultze-Wege, Madame Rousseau, René Ferry, M Bezzi, J. Lind, L. Rolland O. Mattirolo, B. Studer, E. W. Swanton, Denis Cruchet, P. Hariot, A. Jaczewski, L'Abbé Hy, Docteur X. Gillot, J. Lagarde, J. Brunnthaler, Chas. van Bambeke, A. Aclocque, L. Trabut, J. Rompel, Docteur Moreau. Je dois mentionner particulièrement le Père Torrend qui m'a envoyé une grand nombre de spécimens et dans de magnifiques conditions et L. Romell qui a puisé avec genérosité dans sa collection particulière pour me satisfaire.

Dans la bibliothèque du Museum de Paris, j'ai recherché et copié pour ainsi dire tous les dessins qui ont été faits en Europe sur les Lycoperdon y compris quelques travaux rares, par exemple, la Flora Danica que je n'avais jamais vue auparavant. J'ai puisé aussi des renseignements importants dans des conversations avec Messieurs Patouillard et Boudier et dans ma correspondance avec le Réverénd Bresadola. J'ai étudié avec le plus grand soin aussi bien les échantillons que j'ai recus, que ceux du Museum de Paris y compris un grand nombre de spécimens authentiques provenant de Vittadini. Je commence à avoir une idée sur ce sujet mais je considère qu'il y a encore beaucoup à apprendre. J'ai recu un certain nombre d'espèces que je ne peux pas nommer, mais j'espère néanmoins que les études que je compte faire à Kew et peut-être à Berlin m'éclaireront davantage.

Ce qui va suivre est un apercu des principales caractéristiques des espèces d'Europe.

Je m'occuperai d'abord du genre Calvatia qui n'est généralement pas reconnu en Europe mais que je considère pourtant comme très bon. Au sujet des vrais Lycoperdon, je m'arrêterai au groupe de ceux qui s'ouvrent au moyen d'une bouche définie. Les Calvatia sont de grandes espèces qui perdent leurs spores quand le péridium tombe. De plus il y a une différence entre le capillitium des Lycoperdon typiques et celui des Calvatia. Dans les Lycoperdon. le capillitium forme des filaments qui naissent de la columelle et du péridium et qui se rejoignent sans se dépasser; et si on ouvre un spécimen, on peut voir une brisure très nette à l'endroit où ces deux sortes de capillitium se rejoignent. Une semblable disposition n'existe pas dans les Calvatia, mais dans beaucoup de Lycoperdon cette disposition n'est pas visible et je ne crois pas que cette particularité soit aussi bonne pour juger de la différence qu'en se basant sur la brisure du péridium. Il existe pourtant une espèce, le Lycoperdon hiemale, qui est intermédiaire dans sa déhiscence.

Le nom de Calvatia a été proposé par Fries pour une plante américaine qu'il ne pouvait faire rentrer ni dans la classe de ses Lycoperdon d'Europe, ni dans celle des Bovista; mais il n'avait alors aucune idée de ce genre tel qu'il est compris de nos jours. La véritable signification du genre Calvatia a été donnée ces dernières années par Morgan. Pour montrer comment ce genre a été compris par De Toni

(Sylloge) il suffit de remarquer qu'il ne renferme dans ce genre qu'une seule espèce d'Europe, qui n'a aucun rapport avec les Calvatia et qu'il ne mentionne aucune des cinq espèces également européennes qui, probablement, appartiennent à ce genre. Ces cinq espèces sont: Calvatia caelata, saccata, fragilis, peut-être gigantea et hiemalis, et sans aucun doute d'autres que je ne connais pas.

Calvatia caelata est commun et se reconnait facilement à sa forme, à ses spores petites, lisses et de couleur olive et surtout aux filaments de la glebe qui sont gros, épais, fortement colorés et ont plusieurs fois le diamètre des spores. C'est, je crois, la seule espèce d'Europe ayant un capillitium semblable.

Calvatia saccata a généralement une longue tige et une petite tête, telles que les représente l'excellent dessin cité habituellement du Flora Danica t. 1139. J'ai recu de René Ferry un spécimen qui se rapproche par sa forme de C. caelata, mais ses grosses spores échinulées, d'une couleur brun foncé (mais jamais pourpre) le font de suite reconnaitre comme n'appartenant pas à cette espèce. Le Lycoperdon saccatum, que Bonorden décrit comme s'entr'ouvrant par une petite bouche, est sans aucun doute une autre plante.

Calvatia fragilis est la seule espèce d'Europe ayant des spores pourpres et est en réalité une petite variété du Calvatia cyathiformis si commun en Amérique. C'est une plante du sud de l'Europe qu'on ne trouve pas dans les pays du nord quoique la plante d'Amérique pousse même au Canada.

Calvatia gigantea (ou maxima ou Bovista, comme vous voudrez l'appeler) est le "vesse-loup géant" Généralement rond il atteint des dimensions plus grandes que les autres espèces. Il diffère des autres Calvatia comme le Lycoperdon polymorphum diffère des autres Lycoperdon. Sa base stérile est très petite et n'est pas formée de larges cavités comme dans les autres espèces, mais elle est compacte et son tissu est semblable à celui de la gleba. Mon opinion est que c'est un bon genre mais nous ne pouvons lui donner un nom générique quoiqu'on lui ait attribué beaucoup de noms spécifiques. Nous ne pouvons pas employer le mot Globaria (qui avait été proposé principalement pour remplacer celui de Bovista, je ne sais pas pourquoi) quoiqu'il soit employé dans le nouvel ouvrage d'Engler et Prantl où sont confondues deux plantes, gigantea et pusilla, qui sont les plus grands et les plus petits représentants des vesse-loups connus, n'ayant de semblable entre eux que leur forme qui est ronde.

Calvatia hiemalis est une plante dont je ne saurais dire si c'est un Calvatia ou un Lycoperdon, comme je l'ai ailleurs déjà écrit. D'après le dessin de Vittadini, c'est une plante bien connue comme ayant non-seulement une cloison bien définie, séparant les parties fertiles des parties stériles, mais encore un capillitium hyalin. Nous pouvons être certains du Lycoperdon hiemale de Vittadini, étant donné que son spécimen se trouve au Museum de Paris, ainsi que de sa description; mais nous ne sommes pas aussi surs du dessin de Bulliard t. 72 rapporté au même nom. Nous croyons que c'est le Lycoperdon pratense de Persoon, figuré dans le Journal de Botanique, mais le dessin

de Schaeffer t. 184 du Lycoperdon papillatum, souvent cité comme étant cette plante, est très douteux.

Dans les Lycoperdon véritables, on peut citer le Lycoperdon gemmatum et le Lycoperdon piriforme, espèces communes en Europe ainsi que probablement dans toutes les parties du monde tempérées. Le Lycoperdon gemmatum devrait en toute justice être appelé Lycoperdon perlatum, car, de tous les anciens écrivains, Persoon est le seul qui ait eu une opinion nette sur le voile de cette plante, ce qui la distingue de toutes les autres espèces. La description claire et concise (parue dans le Journal de Botanique) qu'il a faite des échinules particulières à cette espèce n'a pas été surpassée jusqu'à aujourd'hui. Le Lycoperdon gemmatum de Schaeffer comprend d'autres plantes et Fries emploie ce nom pour se tirer d'affaire quand il est embarrassé. Gemmatum est pourtant le meilleur nom pour rappeler la forme des aiguillons soudés entre eux et imitant des sortes de bourgeons qui ne se trouvent sur aucune autre espèce. La forme et la dimension varient beaucoup, mais les aiguillons et la structure interne sont toujoures les mêmes.

Le Lycoperdon piriforme est aussi une plante commune partout et pousse sur le bois pourri, sur lequel ses racines se développent, quand on le rencontre sur la terre. Sa columelle proéminente, ses spores petites et lisses et les longs filaments blancs de ses racines caractérisent toujours cette espèce quoiqu'elle présente beaucoup de formes différentes et qu'elle ne soit toujours faite "comme une poire."

Le Lycoperdon polymorphum est une plante très commune nettement caractérisée et mal connue en Amérique et en Europe. A notre connaissance, un auteur américain l'a dénommée de trois noms différents. Il a une base stérile, de conformation spéciale, ne présentant pas de cavités comme les autres espèces, mais compacte avec le tissu semblable à celui de la partie fertile. Quelquefois la partie stérile se développe dans de telles proportions qu'elle produit une base en forme de tige. C'est là un des caractères de beaucoup d'échantillons que j'ai recus du Portugal du Père Torrend. Dans les régions septentrionales, la base n'est pas aussi développée et le champignon est plus arrondi. Quelquefois, je crois qu'il n'y a pas de base stérile ce qui est le cas j'en suis convaincu du Lycoperdon dermoxanthum de Vittadini (d après le type du Museum de Paris). Cette plante a recu sans aucun doute des noms dès la première heure: Lycoperdon furfuraceum est probablement l'un d'eux, mais je crois que le dessin de Schaeffer n'est pas suffisamment exact pour pouvoir y être rapporté avec certitude. Le Lycoperdon cepaeforme, d'après toutes les formes différentes figurées par Bulliard est probablement la même espèce. La plante est plus jaune que les Lycoperdons en général et le capillitium est fortement coloré. Je l'ai vue de couleur jaune clair au moment de la maturité des spores. (A cette période la plante est appelée en Amérique Lycoperdon coloratum).

La différence entre le Lycoperdon pusillum (avec les mêmes spores et la même voile que dans le Lycoperdon polymorphum) et les formes sans base stérile de cette espèce, ne me semble pas très claire et je crois que les formes arrondies du Lycoperdon polymorphum ont

souvent été prises pour le Lycoperdon pusillum. Pourtant je crois que le Lycoperdon pusillum tel que l'a montré Quelet est une espèce distincte ayant une gleba de couleur brun foncé, de dimensions plus petites, n'ayant jamais de base stérile et pourvue d' une forte racine pivotante. J'ai vu quelquefois des échantillons européens que je prends pour des Lycoperdon pusillum, mais tous ceux que j'ai observés en Amérique doivent être rapportés au Lycoperdon polymorphum mais avec une base stérile très petite, quoique distincte, ressemblant tellement à la partie fertile qu'il faut l'examiner avec soin.

Le Lycoperdon marginatum et le Lycoperdon cruciatum d'Europe, ainsi que le Lycoperdon separans des États-Unis, ont tous le même voile si particulier et les mêmes spores. Ils appartiennent probablement tous à la même espèce mais je ne puis comprendre pourquoi l'ensemble des spores est de couleur si sombre en Europe quand il est de couleur claire en Amérique.

Le Lycoperdon velatum, d'après le dessin de Vittadini et peut-être mieux encore d'après la figure ancienne de Micheli, est une espèce très bien caractérisée par son voile laineux qui pèle par grands morceaux. C'est une plante rare en Europe. D'après les observations de Persoon (Journal de Botanique, 1802) il est impossible que ce soit "mammaeformis" comme on l'a si souvent dit.

Le Lycoperdon echinulatum avec ses fortes arêtes et ses spores de grandes dimensions. échinulées et pourpres, est une espèce si différente des autres qu'il est difficile de penser qu'il puisse y avoir confusion. Toutefois Fries donne ce même nom à une variété de Lycoperdon gemmatum (sic) et décrit encore la plante comme un Lycoperdon constellatum. La plante est très bien figurée par Quélet ainsi que dans la Flora Danica (t. 1800)

Les Lycoperdon atropurpureum, hirtum et umbrinum sont des plantes ayant les mêmes spores que le Lycoperdon echinatum mais diffèrent beaucoup quant à leurs voiles. Comment diffèrent-ils entre eux, si toutefois ils diffèrent, je n'en sais rien? Je crois pourtant qu'il y a plus d'une espèce parmi eux.

Quant au nom de Lycoperdon excipuliforme je n'ai pas de données exactes à son sujet. Celui de Fries s'applique à une variété de gemmatum qui ne mérite même pas de dénomination particulière. La figure de Richon et de Roze, a trait apparemment au Lycoperdon saccatum. La plante appelée Lycoperdon piriforme var. excipuliforme, est tout à fait distincte, par sa forme, du Lycoperdon piriforme habituel et à mon avis, doit être distinguée, mais je crois que ce n'est pas la plante qui est généralement décrite sous le nom de Lycoperdon excipuliforme.

Le nom de Lycoperdon pedicellatum, donné par Peck en Amérique, devra être appliqué également en Europe où on décrivit, peu de temps après la même plante comme Lycoperdon caudatum. C'est une espèce toute particulière avec des spores ne ressemblant en rien à celle des Lycoperdon véritables, en ce sens qu'elles ont de longues queues, caractère assez fréquent dans les Bovista mais pas connu ailleurs dans le genre Lycoperdon. Je n'en ai vu qu'un échantillon d'Europe (Suède), grâce à M. Romell. Mais on trouve le Lycoperdon pedicellatum en Allemagne et, c'est probablement une plante du Nord, qui n'est pas rare aux Etats-Unis.

Il existe un grand nombre de noms souvent signalés dans les ouvrages européens, mais je ne connais pas les plantes auxquelles on les rapporte. C'est le cas des Lycoperdon candidum, montanum, molle etc. aussi bien que des treize (chiffre fatidique) espèces embarrassantes que Bonorden a proposées. J'espère que mon prochain séjour dans les Musées d'Europe m'éclairera à leur sujet. Je vais faire mon possible pour voir les types de Persoon, si ils existent. car de tous les travailleurs de la première heure, je crois que Persoon seul a formulé son opinion d'après les plantes qu'il avait étudiées. Il est tout à fait évident que les autres travaux anciens ont été faits d'après des dessins vagues et souvent peu exacts.

270—NOMENCLATURE.

While I can candidly say I have no hope of inducing others to abandon the present system of personal advertisement in affixing their names to the names of plants, I think I have succeeded in drawing attention to the evils of the system. I was gratified to receive a letter from one of the foremost mycologists of America, one who has published much good work and whose name I do not give as I do not wish to draw him into the discussion. It read as follows: "Let me say I am coming to believe your idea upon the omission of authors' names in connection with plant names is a desirable thing. The present condition of botanical nomenclature, especially in America, is unsatisfactory to everybody, even the most enthusiastic advocate of the newer procedure. If we could have a general botanical congress for the adoption of names in certain standard works, I believe it would be better than trying to live by the rules of priority. However heterodox this may seem to many, I am persuaded that the result would be beneficial if the agreement could be decidedly and widely made. Success to you in your laudable efforts."

Personally I do not feel that such agreement is practicable or necessary. No congress can legislate for an individual worker. The names an author uses should reflect his views of classification.

The genus Bovistella was discovered and described by an American. I learned the boundaries of the genus from his work, and I find in the herbaria of Europe a large number of plants, now called Lycoperdon and Mycenastrum, belonging to it. Should I locate and publish them I would have to call them Bovistellas in keeping with my present views as to how they should be classified. No congress or course could bind me to call them Lycoperdons and Mycenastrums simply because they appear under these genera now in all books "standard" and otherwise. Nor should I do so, for to my mind they are not Lycoperdons and much less are they Mycenastrums. There is nothing in the situation, however, to necessitate or merit my name being put after the "new combination". If I had worked with "puff balls" before the genus Bovistella was pointed out, perhaps I would have overlooked it as did all the European authors, but now that the genus has been pointed out it is not particularly to my credit, but on the contrary would be strongly to my discredit, if I were not able to recognize the misplaced specimens when I find them out of their class.

Changes in plant names are inevitable if we are to have any advance in classification, but changes should be gradual and are demanded solely by the progress made in classification. One of the greatest evils in modern botany is the class of pure name-jugglers, who for the love of seeing their names added to plants dig up all kinds of vague excuses to change plant names. These men do not perhaps advance a single new thought or idea regarding the relationships or classification of plants. They simply dig back into the musty and dim records of the past, and unearth some forgotten fact, or more often make some supposition or guess, and then proceed to elaborate a lot of new combinations to which their own is invariably added. It is not, however, the use of personal names in citations to which I object. It is the abuse to which this system leads. I firmly believe if it were not for this abuse we would be spared most of the modern name-juggling that is bringing our plant names into such a chaotic condition. In the puff ball world men juggle plants they never saw from out one genus into another wherein they have not the slightest relationship, solely it appears to me, for the purpose of making a change. Men "describe new species", and yet it is evident judging from their work that at the time they are absolutely innocent of any knowledge of the existence of the genus to which their plant actually belongs. If a man does not know the genera, how can he be expected to tell whether or not his species is new?

271--NOTES ON SPECIMENS IN FRIES' HERBARIUM.

Labeled "Cauloglossum pistillaris", published by Fries as "Cauloglossum elatum", type from Koenig, India. The specimen is a Podaxon with bright olive spores and without trace of the peridium.

Cauloglossum transversarium. The specimens are from Curtis. One is labeled "Arthymenium transversarium, B. & C." Fries has this notation—"Scarcely cogeneric with C. elatum, differing from the section by the pileus continuous with the stipe". As the specimen is not cut open Fries evidently did not know the vast internal difference between it and "C. elatum".

Coilomyces Schweinitzii, from Berkeley collection by Schweinitz in Surinam and called by Schweinitz "Onygena Lycoperdoides". The specimens are two in fine condition, but as neither is cut open I do not know their internal structure. Externally they resemble unopened Geaster mirabilis. The genus Coilomyces is said to be a peculiar genus hollow at the center.

"Disciseda compacta". Czerniaiev sent Fries abundant specimens of his species. It is Catastoma subterranea. Czerniaiev undoubtedly anticipated Morgan in the genus but it was so vaguely described that it remained unrecognized for sixty years, until an investigator who had learned Morgan's genus from his specimens recognized Czerniaiev's in the light of Morgan's work, and used it as

an excuse to add his own name to it. Had he been sincere he would have hunted up these specimens and *substituted* Czerniaiev's name. The beauty of the modern method of juggling names is well illustrated by the history of this plant. A Hungarian mycologist called the plant Bovista debreceniensis. Hollós in 1899 published it under that name, not recognizing from his own work the claim the plant has to generic rank. Then he received some specimens from Morgan of Catastoma subterranea, and as he saw it was the same plant he proceeded at once to juggle it and publish it as "Catastoma debreceniensis, *Hollós*" (1900). The second year after, having learned Morgan's genus, he recognized the vague record of Czerniaiev, and proceeded at once to juggle a new name, "Disciseda debreceniensis, *Hollós*" (1902). Information has just been published that the plant is the same as Lycoperdon defossum. He can now juggle it to "Disciseda defossa, *Hollós*," and if he will cross the Atlantic and examine Schweinitz's herbarium he will find evidence sufficient to again juggle it to "Disciseda candida, *Hollós*."

Bovista tunicata (type). This species is in my opinion simply an immature plumbea which has retained the olive color of the gleba. As I have already given my views (Myc. Notes, p. 115) on the value of color characters of the gleba of Bovista plumbea, it is not necessary to here repeat them.

Geaster Bryantii, type from Berkeley, as you will find it illustrated on p. 16, Geastrae.

Geaster calyculatus, type from Fuckel. The specimen is pectinatus notwithstanding the illustration Fuckel gives is that of Bryantii. Fuckel probably did not distinguish the two species which are very similar.

Geaster capensis type from Cape Bonæ Spei. I think it is saccatus.

"Geaster Curtisii, Rav." from Curtis. This is radicans, or rather as I have previously stated the fornicate condition of velutinus. It is very probable that Curtis sent this specimen to Berkeley so labeled, as it is the second I have seen that he so distributed, but Berkeley did not propose to advertise two Americans by calling it "Geaster Curtisii, Rav.", so he changed it to "Geaster radicans, Berkeley" and he did right.

Geaster saccatus, Brazil, Lund. The type specimen is there but it is so small and twisted up and the endoperidium does not show so that I think no one could say whether or not it is the same plant now so called in the United States. As previously stated if the name Geaster saccatus has a meaning, it was given to it by Berkeley.

"Geaster stellaris, Fries MSS". These specimens are historically of interest, as they probably explain Fries' views of the name "Geaster stellatum" in his "Systema". The plants are Geaster floriformis. In this connection I wish to pay my respects to the recently juggled name "stellatum" for hygrometricus. If there is a name particularly

appropriate for this Geaster, it is hygrometricus, and is thoroughly established by a hundred years of constant and universal use. The early botanists who had very vague ideas as to Geasters thought they were all "stellate Lycoperdons". Linnæus' "Lycoperdon stellatum" is simply a generic idea for the genus Geaster. He knew no species and referred to "Lycoperdon stellatum" every picture of a Geaster he found, some half dozen different species. To attempt to substitute for a definite, descriptive name such as hygrometricus a vague, meaningless name like "stellatum" seems to me very bad. Nor is that all. Those who take Morgan's idea of the genus Astræus, and substitute a new combination, "Astræus stellatus" commit a further violation of their own "rules" of which they are probably not aware. Morgan was not the first to isolate Geaster hygrometricus on structural grounds. Corda did exactly the same thing, but in a different manner so that there still remains abundant excuse to juggle "Astræus stellatus" back to "Geaster stellatus" and juggle all the other Geasters to Plecostoma, forming new combinations for all the Geasters. The early workers with the Gastromycetes, especially Fries, worked mostly with books. Fries "Systema" is a very complete historical account up to that time. It is a simple matter to take a copy of Pritzel, look up dates and juggle the names about on the synonyms given by Fries. It is an easy way of gaining a little notoriety, neither honest nor meritorious.

"Geastrum minimum" type from Chevallier, a plant of great historical interest, probably the only one in existence. It is the plant we have illustrated as Schmidelii, but as Chevallier published fifteen years before Vittadini, of course. Chevallier gave a very poor figure of his plant and a recent guess has been published that it was Geaster asper.

Geaster granulosus from Fuckel=G. minimus, confirming synonym already given.

Secotium Thunii type from Schulzer. The plant does not differ in any respect from Secotium acuminatum.

Geaster melanocephalus, Ostergothland, E. Fries. I do not think the name was ever published, but record it in case it has been. The plant is Geaster limbatus.

Lycoperdon constellatum, type Fries. This characteristic plant is as is well known the same as Persoon's L. echinatum.

Geaster fimbriatus, which is the most common species in Central Europe, is abundantly represented in the collection at Upsala. Fries did not distinguish the American plant (which Berkeley called "saccatus") as different, for the specimens from Pennsylvania are labeled "fimbriatus".

Geaster mammosus. Though Fries is often cited as the author of this species, it is evident both from his description and from the only specimen in his collection (included among specimens of hygrometricus) that he did not know Chevallier's plant.

MYCOLOGICAL NOTES.

BY C. G. LLOYD.

No. 17.

CINCINNATI, O. JUNE, 1904.

272--NOTES OF TRAVEL.

KEW.

The institution at Kew I consider the chief botanical institution of the world, especially in phaenogams. Including the gardens and herbarium, it is a mammoth plant, employing I am told nearly 200 persons. Under the efficient directorship of Sir W. Thistelton-Dyer it is run with the system and precision of an immense business house. Everything is system and order. In it I spent more than two months studying "puff-balls" and was afforded every opportunity to study the collection and consult the library. If I was pleased with the library facilities at Paris, I was delighted at Kew. Here it seems to me is to be found every book a botanist has occasion to consult. The books are conveniently arranged. and the rules are the simplest. With the proper introduction, a student has free access to the shelves, and when he takes a book all that is asked is that he put a card with his name in the vacant space. Nowhere can one study the literature of a botanical subject as thoroughly and as conveniently as at Kew. To W. B. Hemsley, who is chief of the Library and Herbarium I am indebted for every courtesy in the matter.

The Fungi collection at Kew comprises three important herbaria, that of Berkeley, Hooker and Cooke. Berkeley's collection is richest in specimens of historic interest for he did most of the descriptive work and was in close touch with Montagne and Vittadini. The collection is especially rich in Vittadini types.

BERKELEY.

I learned much of interest concerning Berkeley while at Kew. He was never connected with the institution, nor did he live in the vicinity. He was a clergyman in a country district, with a large family and a modest income. The pioneer in mycology in England, he was indefatigable in pursuit of the subject though it never directly brought him any financial return. Having studied his types, descriptions and illustrations, I can but acknowledge that his early work was most excellently done. Toward the latter part of his life he was overwhelmed with specimens from all parts of the world and his latter descriptions are not so thoroughly nor carefully accomplished. Unfortunately the American plants were worked up during the latter period.

MASSEE.

Of course I became quite well acquainted with Prof. Massee, who is chief of the Mycological department at Kew and I am indebted to him for many kindnesses. He is a man I should say about fifty years of age, an excellent conversationalist and I am told a very entertaining public speaker. The duties of his office require a knowledge of the entire mycological field, from a simple determination of specimens to the study of plant diseases and the investigations of the most abstruse questions in connection with the biology of fungus forms. I doubt if there can be found in England another man who can fill this comprehensive position as acceptably as Massee. To me he was very cordial and I enjoyed very much my acquaintance with him.

THE BRITISH MUSEUM.

The collection of puff-balls in the natural history department of the British Museum is neither as extensive nor historically as interesting as that at Kew. It is largely made up of purchased sets and I think there are more "exsiccatæ" there than in any other museum I have yet seen in Europe Ravenel's herbarium is to be found there, also the Welwitch plants and Broom's collection.

Broom was a co-worker with Berkeley and his plants are all duplicates of the Berkeley collection. Broom, who was a gentleman of wealth and leisure did the microscopic work for Berkeley and this accounts for the frequent citation "Berk. & Br."

A few plants I have found at the British Museum that I had not previously seen, such as Secotium Malinvernianum in an Italian exsiccata, and the Welwitch and Curry types. There is to be found here also some fine specimens of Tylostoma Leveilleanum of Hawaii. The types at Paris are in bad condition.

Miss Annie Lorrain-Smith seems to do most of the fungi work at the museum but at present is engaged in working on the lichens. An extensive exhibit of all the British Agarics in water colors by Worthington G. Smith is displayed in the "show department." There also can be found the Leister collection of drawings of the Myxomycetes. Though I know nothing of the subject, they impress me as being of very great excellence and I am told are the finest illustrations of the subject that have been prepared. Leister is a brother of the celebrated surgeon, a man of great wealth, with his city residence, his country residence, his parks, etc. and I think he also has some "titles." Neither his wealth nor his "titles" however, have prevented him getting enjoyment from natural history and he is more fortunate in his tastes than most men in his position.

I met at the British Museum Mr. Jepp who works mostly with mosses, Mr. V. H. Blackman, and in the phænogamic department. Mr. E. G. Baker, and Mr. Britten the editor of the "Journal of Botany."

THE LINNAEAN HERBARIUM.

The "puff-balls" of the Linnaean collection are of more interest in showing how little the "Father of Botany" knew of these plants than their historic or other value. They consist of exactly six speci-

mens. The "type" of Podaxon pistillaris is here, also of "Lycoperdon, stellatum"; or rather two "types" for Linnaeus labeled two species of Geaster, "Lycoperdon stellatum" and neither is the one that modern name jugglers have shuffled under that name.

LEIDEN.

To my mind the most historical collection in existence of the fungi of Europe is the herbarium of Persoon the "Father of Mycology." Persoon was a good collector and it was gratifying to find his herbarium in very good condition and fairly complete Persoon worked before the days of the microscope and was evidently much puzzled (as are we of later days) with the confusing forms in the genus Lycoperdon. He labled many of his specimens with a ? mark, and many of his species include specimens that we now are certain are entirely different species. It was of great interest to me to study these specimens from the historical light they threw on the subject but I shall not attempt to change established usage in Europe though several names attributed to Persoon are now used in a sense not historically correct. It is use that makes language and a plant that has acquired a name from general use "or misuse" should retain it. Old and familiar names are good names and I do not favor changing them.

Persoon's herbarium is not kept at Leiden as it should be, separate and distinct on account of its historical importance, but is made a part of a general herbarium. At present it is the greater part of the mycological collection and the few other plants mixed with it do not matter much, but if it were a large collection as at Kew and Berlin such a condition would be unfortunate. I am under obligations to Dr. J. W. Gotthart, the Conservator of the "Rijks-Herbarium" for facilities to study it. Dr. Gotthart speaks English very fluently. The "Rijks-Herbarium" where Persoon's specimens are preserved in the language of Holland means "National-Herbarium."

BERLIN.

Nowhere else in Europe have I noted more botanical activity than at the Botanisches Museum at Berlin. The director, A. Engler, is a very energetic man and under his management the institution is fast taking the lead in botanical matters. They have outgrown their present museum facilities and now everything is crowded but a new building is in process of construction which will afford them ample room.

The mycological department is under Dr. Hennings. It is extremely rich particularly in African plants and I found there in the "puff-ball" line many species not to be found elsewhere in Europe. It is also of considerable importance historically as Link's Ehrenberg's and many of Kalchbrenner's plants are to be found there. I know no one in Europe that I like better than Dr. Hennings personally. I could not speak German, nor he English or French, but we both knew a common subject and managed I think to convey our ideas to each other. Dr. Hennings is a very busy man, and I think that more specimens are reaching Berlin to day than all other institutions combined. Dr. Hennings was most liberal to me, not only affording me every op-

portunity to study and photograph the collection but gave me type specimens of many of his new finds. The specimens at Berlin are preserved in envelopes and boxes, and are not glued down. Thus I was enabled to make good photographs of everything of interest which will explain why we will reproduce in our plates in future so many more photographs of the Berlin specimens than from Kew or Paris where the specimens are glued down and cannot be photographed to advantage. I spent a very pleasant month at Berlin.

DR. MAGNUS.

Herr. Prof. Magnus is a very active German mycologist with as large a private collection as I have ever seen. I found there much of interest including two collections of Trichaster melanocephalus from Germany. Only one other specimen has ever been found in Germany and this was in Link's collection. Dr Magnus is professor of cryptogamic botany in the University and is a large man both physically and intellectually. He readily speaks English and several other languages. I met in Berlin Dr. Alfred Möller well known for his work on the Phalloids and Brazilian Fungi.

273--THE HISTORY OF GEASTER FORNICATUS IN ENGLAND.

The fact that there are two fornicate geasters that have been confused since Fries' day under the name Geaster fornicatus is I think now usually admitted. One is a little pine-woods species which we call G. coronatus, the other is a large black plant that grows in frondose woods and which we have previously argued should bear the name Geaster fornicatus. The historical side of the question turns on the identity of the plant called by Hudson, Lycoperdon fornicatum. We desire to acknowledge our indebtedness to Mr. Jepp of the British Museum who kindly interested himself in looking up the evidence, also to Prof. Britten whose knowledge of the history of British botany is unsurpassed.

As Hudson's specimens were mostly destroyed by fire we can only present indirect evidence on the point. We supposed from the evidence that had reached us in America that the large black plant was the only species of the two that grows in England, but in this we were in error for we find a collection of the little pine-woods plant at Kew and also at the British Museum. Still it is far rarer than the other species which appears to be common, there being seven different and abundant collections of the large black species at Kew and three at the British Museum. It is also worthy of note that all the English illustrations are of the large plant. Hudson in his last edition (1762) gives the habitat ' in pastures and fields but rare" at Buckleburg Berkshire and Wickham Kent. The nature of the forests in these districts is additional evidence, for each species has its peculiar habitat. Mr. Jepp who is familiar with the Kent section tells me it is a frondose woods only, so that it must have been the large black species that was collected there.

As to Berkshire however, it is not so clear, for patches of ever-

green woods occur there as well as frondose It might be argued that as Fries mistook Hudson's plant, the name Geaster fornicatus should belong to Fries' plant, and from the further fact that the little pine-woods species is very common on the continent and is the plant usually distributed under this name in the exsiccatae of which the Germans are so prolific. No less than sixteen different collections of the little pine-woods species is in the British Museum labeled "fornicatus" and it is one of our contentions that established "use" makes language. If the makers of exsiccatae were content to label their plant simply "Geaster fornicatus" we might take this view of it but when they label it "Geaster fornicatus (Hudson) Fries" we protest, for no such plant ever existed.

A further bit of evidence in regard to the original meaning of the name "fornicatum" is found in the Linnaean herbarium where there is a specimen of the large black plant labeled "Lycoperdon fornicatum." Surely this is very "prior" evidence. The plant is not in the Linnaean handwriting and Linnaeus never published it. I think there is a possibility that it was sent him by Hudson.

274—N'ABUSEZ PAS DU MICROSCOPE.

"Soit dit en passant, l'histoire naturelle moderne tend à abuser des verres grossissants: cette méthode, sans doute, née en Allemagne, ne peut amener d'autre résultat, en admettant d'ailleurs qu'elle soit impeccable, que d' éloigner de la science une foule de personnes, bien capables d'apprécier la forme d'une corolle on d'une feuille, mais reculant devant les finesses de mystères qu'un grossissement de 500 diamètres laisse à peine entrevoir.

Remarquez que ce n'est pas là une opinion purement personelle. "N'abusons pas du microscope si nous tenons à ce que les avenues du moins de la science ne soient pas fermées à la généralité des naturalistes. Un petit nombre d'élus pénétrera dans le sanctuaire"—Jaubert.

D'une manière générale, l'introduction exagérée des méthodes scientifiques dans les études est nuisible; sait-on mieux le latin parce que à la règle *liber Patri* on a substitué des subtilités grammaticales."

—A. Acloque in Cosmos.

The above is exactly in line with what we have written on the subject. (Cfr. The Genera of Gastromycetes, note on p. 5, also Myc. Notes, note on p. 147). We do not undervalue the microscopic features of fungi. We do not maintain for a minute that divisions of the Lycoperdon by Fries in his early days on the shape of the plant are superior to those of Massee on the nature and markings of the spores, especially as we find in the same collection and species of Lycoperdon all kinds of shapes. But we do not believe in separating plants that are obviously related in their mature states, on some microscopic feature that can only be known from young specimens. We think there is no room between Astraeus and Geaster for the Nidulariaceæ, if indeed we thought it were even wise to make two genera of them.

Prof. Morgan describes Phallogaster saccatus as a Phalloid. Anyone who knows a Phalloid would place it there at once should he collect it. It has same spores, the same "smell" and "smell" is a *strong* feature of the Phalloids. It differs in form, but no more than does Clathrus, from Phallus. The compilers of Engler and Prantl have placed it in the Plectobasidiineae, a mixture of phalloids, Hymenogasters, Sclerodermae, etc., plants the mature forms of which have no resemblance to each other and which are thrown together because it is said the basidia are similiar. No one who collects the plant will look for it there. And, by the way, the "Natural Order" Hymenogasteaceae was formerly a very *natural* order. One knew a Hymenogaster as soon as he picked it up. Now since the order has been *fully illustrated* by its basidial characters, he is a wise man who can tell a Hymenogaster when he finds it. It may be a more "scientific" method of classification, but for me I prefer one more PRACTICAL.

275--ERRONEOUS GENERA AND SPECIES.

In working with the type specimes of puff balls in the museums of Europe, one cannot fail to be impressed with the large number of erreneous genera and species that have been proposed on imperfect material, mostly sterile bases of Calvatias and unopened Geasters. When one's attention has been so directed it is easy to recognize these conditions but unless we are on our guard it is a natural error to mistake them for perfect plants. It may seem strange to us in America, where the genus Calvatia is common, and where we note the sterile bases abundantly every spring, that they should have deceived even the early botanists in Europe. We should bear in mind however, that those observers had no opportunity of studying this genus typically. It grows so common with us as to be familiar, but they did not know that there exists a genus in which the fertile portion wastes away leaving a sterile base that has a resemblance to a perfect plant. It is only natural therefore that they should take these bases for perfect plants especially as they find spores in the tissue. Whether these spores are accidental or whether the sterile base normally developes a few spores is a question I cannot answer but it is a fact that spores can usually be found in this tissue on microscopic examination.

THE GENUS HIPPOPERDON.

All species of this genus (with one exception) are founded on sterile bases of Calvatia. I was positive as soon as I saw the type specimens of Montagne's original species Hippoperdon Crucibulum (Syl. Crypt. No. 1057) and Hippoperdon turbinatum (Syl. Crypt. No. 1058) that they were both simply sterile bases. I think that Montagne had a suspicion of it, as I find in his herbarium on the sheet of Hippoperdon Crucibulum a transcript of Bosc's Lycoperdon cyathiformis of which plant it is the sterile base I am quite sure that Berkeley was aware of this for while abundant specimens are in his collection labeled Hippoperdon Crucibulum from Drummond New Orleans, he sent one of them to Montagne with a query the substance of which is ' If this is your genus Hippoperdon is it not also 'our' Bovista lilacina."

Figure 71.

"Hippoperdon Pila" from type specimen in Museum Paris.

Montagne evidently thought it was, for he placed it with that species.

The specimen on which Léveillé founded Hippoperdon Pila (Ann. Sci. Nat. 44-221) while a sterile base of the same species is very deceptive. For several months after I was in Paris I did not feel sure about it. Léveillé stating that Montagne's specimens were imperfect plants but that his was entire and the plant has every general appearance of so being (see fig. 71.) The tell-tale margin where the diaphragm joins the peridium in most sterile bases was worn away in this specimen and the diaphragm has every apperance of being the top of the peridium. Finally one day while in Paris I received a fine lot of sterile bases of Calvatia lilacina from Dr. Florentine Fellippone, Montevideo, Uruguay, some of them fresh and their nature very evident, others weather worn and closely resembling Léveillé's specimen so that there was to me no further doubt about it.

Hippoperdon piriforme (Ann. Sci. Nat. 3-5-161) the type does not exist.

Hippoperdon Sorokinii (Sac. Syll. 7-133) is described as having "the mass of spores dark yellow" and as the genus "Hippoperdon" never had "a mass of spores" it is not worth while to further trouble ourselves with this "species." "The 'unique exemplaire' was flattened by the foot of a camel." What a pity!

Hippoperdon pisiforme (Bull. Soc. Myc. 90-48) the only species of the genus not founded on a sterile base, is probably an immature Lycoperdon and its author now in a private letter to me accepts this view of it. Figure 72 is from the type specimen.*

Figure 72.

OTHER STERILE BASES.

The early definition of the genus Bovista, and a very crude one in the light of the present knowledge of the subject was a "puff-ball without a sterile base." In other words a puff-ball with a homogenous substance. It happened in a few instances where specimens were received that were all sterile bases the authors finding the substance homogenous thought the plant had no sterile base and refered it to the genus Bovista.

Bovista dealbata (Jour. Bot. 88-131) is a fragment of a sterile base probably of a Calvatia.

Bovista stuppea (Grev. 2-50) is the sterile base of Bovistella Ohiensis.

UNEXPANDED GEASTERS.

A fertile source of error are unexpanded Geasters. Epigaean Geasters do not grow in Europe and unexpanded specimens are liable to be taken for perfect plants even in countries where they grow. When I first found them growing I had no suspicion of their true nature (cfr. Geastrae p. 35) and it was only by accident that I made the discovery. Up to very recent years we find them referred to other genera.

*Kalchbrenner made a curious error in regard to this plant. It was described as Polyporus pisiformis (Grev. 10-98) by Cooke from specimens received by Kalchbrenner under this name. The type at Kew is a little fragment not worthy of mention much less description, but it is surely a polyporus. But Kalchbrenner sent to Berlin under the same name specimens that are young lycoperdons and have not even a superficial resemblance to those he sent to Cooke. The latter were described as "Hippoperdon pisiforme."

Massee I believe was the first to suspect their true nature, (Jour. Mycology, 5-185.) The matter was thoroughly brought out in our Geaster pamphlet, p. 35.

THE GENUS CYCLODERMA.

I have seen all but one of the types of the genus Cycloderma and they are all unexpanded specimens and most of them Geasters.

I am in doubt as to the original species Cycloderma indicum (Linnaea 32-203) for the immature gleba is very similiar to that of Mycenastrum Martinicense and the latter is certainly not a geaster. Cycloderma indicum cannot be an unopened Geaster triplex as has been stated. What it is, I do not know but it surely is an immature something, and not worth further notice

Figure 73.

Cycloderma Weddellii (Ann. Sci. Nat. 4-5-373) is also an immature something (see fig 73 from the type in the Museum Paris) but does not seem to me to be a geaster. It was described as "subternatum" and the type specimen certainly is (see figure 73) but that is probably a character only of this individual specimen.

Cycloderma Ohiense (Grev. 11-95) Cycloderma platysporum (Grev. 16-73) Cycloderma stipitatum (Bull. Soc. Myc. 99-204) Cycloderma depressum (Bull. Soc. Myc. 00-182) Cycloderma pusillum (at Kew, but not published I think) are all I am sure unexpanded geasters.

I did not find at the British Museum where it should be, the type of Cycloderma apiculatum (Jour. Bot. 95-340.)

THE GENUS DIPLODERMA.

The original species, Diploderma tuberosum (Link, Diss. 2-44) is surely unopened Geaster hygrometricus. Diploderma fumosum (Grev. 16-2) Diploderma melaspermum (Grev. 20-35) are unopened geasters.

Also according to Hollos, Diploderma Ungerii (Verh. Zoo. Bot. Wien 16-802) I have not seen it.

Diploderma glaucum (Grev. 15-99) Diploderma pachythrix (Grev 18-50) and Diploderma sabulosum (Grev. 21-38) belong to the genus Mesophellia, or very close to it.*

Diploderma suberosum (Grev. 15-99) Diploderma album (Grev. 16-2) are based on specimens so very immature that the genus cannot be told. I think they are not geasters.

OTHER UNOPENED GEASTERS.

The genus Coilomyces, and the only species, C. Schweinitzii, (Jour-Acad. Nat. Sci. 53-277) is in my opinion unopened Geaster mirabilis.

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*A striking example of the matter that is put forth as "science" which is purely guess work is Dr. Hollos' recent publication on the genus Diploderma. Having seen the original species at Berlin of Diploderma indicum and correctly referred it to unopened Geaster hygrometricus he jumps at the conclusion that all Diplodermas are unopened Geasters He compiles a list of nine species, only two of which he ever saw, and gravely informs his readers that they are unopened geasters. As a matter of fact three have elliptical fusiform subhyaline spores more closely related indeed to the phalloids as far as the spores are concerned than to the genus Geaster.

Bovista velutina (Jour. Linn. Soc. 14-78) Lycoperdon golungense and Lycoperdon tomentosum (Trans. Linn. Soc. 26-287) (the latter compiled in Saccardo as Bovista tomentosa) Lycoperdon tephrospermum (Jour. Linn. Soc. 10-718.) I should refer all to unopened geasters.

OTHER GENERA.

Stella Americana (Jour. Myc. 5-185) as I have already supposed (Myc. Notes, p. 82) is a specimen of Scleroderma Geaster with an accidental cleavage of the peridium.

The genus Sclerangium (Ann. Sci. Nat. 3 9-119) I am satisfied, notwithstanding very eminent authority to the contrary, is a false genus and should be referred to Scleroderma. I have received fresh specimens from Florida and the "endoperidium" of this specimen was represented by a few fragments of the exoperidium that had adhered to the gleba and slivered off from exoperidium. The young specimens show no sign of two layers of the peridium and I am satisfied there is no such genus as Sclerangium with two distinct peridia.

Scleroderma pyramidatum (Grev. 10-109). A specimen that answers the description (though numbered A 374 not A 375 as cited) is at Berlin and is no doubt Kalchbrenner's type of this species. It is a curious plant from South Africa with large rough cortex warts but is so immature that little can be told about its genus excepting it is *not* a Scleroderma.

Sphaericeps lignipes (Trans. Linn. Soc. 26-290). The type of this genus is a little gleba at the British Museum. Prof. Massee examined it years ago and stated that it is a Battarrea, which it surely is, and still we find the genus considered as valid in the most recent compilation (Engler & Prantl) which shows how much easier it is to introduce error than to get rid of it. The genus Battarrea is characterised by the possession of a kind of false capillitium " annulated cells" as they are known and which no other genus has. The genus can therefore be recognized from the merest fragment of the gleba. What the source was of the wonderful figure that represents this genus we do not know. The original is not at the British Museum. As it is well known, the Welwitsch fungi lay around for a number of years before Curry "described" them, and as there is no specimen in existence from which the figure was drawn* I surmise it was reconstructed by Welwitsch from memory. It impresses me, as being about what a collector would reconstruct from memory after a lapse of years, of the genus Battarrea, especially if he was not a mycologist and did not observe very closely the plant. The genus Battarrea is well known from Africa, being in several collections, and there is no doubt that it is the origin of the genus Sphaericeps.

We have found in the museums of Europe a great many plants that impress us as being wrongly classified, synonyms etc. but the preceding are all that we recall that we think are based entirely on errors.

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* Monsieur Hariot tells me he learned from inquiry that the specimen is not at Lisbon Portugal, where there is a possibility it might be.

276—ANTHURUS BOREALIS IN ENGLAND.

We called attention on page 132 to the discovery of Anthurus borealis in Germany. We are pleased to present a photograph herewith (fig. 74) of a specimen that was found last year in *England* by Carleton Rea at Worcester England. This plant is more "stocky" than the forms we have seen from this country but is we think the same species.

Figure 74.

There is considerable mystery concerning the source of the plant. It is surely an introduced plant both in this country and Europe and its home is probably Australia. In fact it seems to me to be the same as Lysurus australiensis as illustrated in Cooke's handbook under this name. Carleton Rea gives a fine illustration of his plant in Trans. Brit. Myc. Society of last year. I know of only six collections of the plant in the United States and will be glad if any of my readers can give additional.

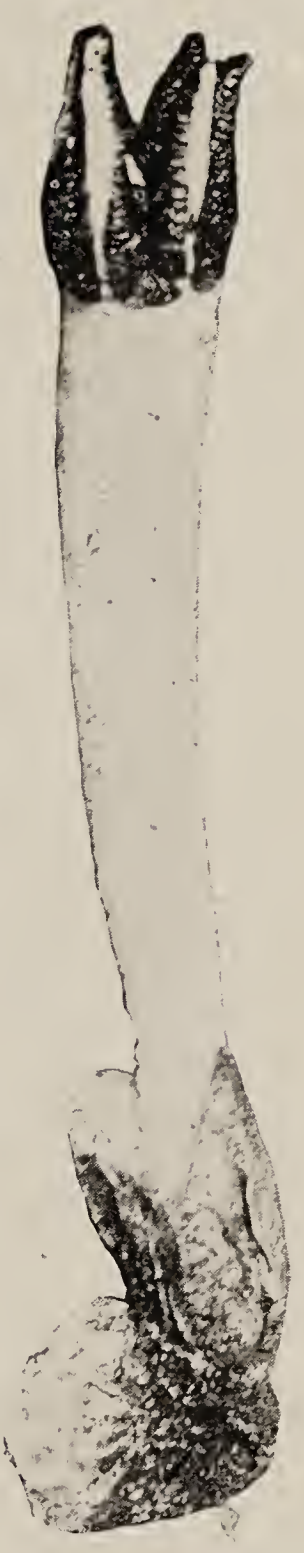

Figure 75.

1st. It was collected by Prof. Burt at two stations at East Galway, New York in 1893.

2nd. It was collected by David Griffiths in grounds of Columbia University (Bull. Torr. 99-628)

3rd Prof. Beardslee gave me an alcoholic specimen collected in the neighborhood of Cleveland.

4th. G. E. Stone sent me a photograph of plants found in the green house soil at Amherst, Mass.

5th. Geo. B. Fessenden told me he collected the plant in the "railroad yards" near Boston where stock cars had been unloaded and it was his impression it was an emigrant from "further west."

6th. It was collected at Sherruck. Delaware Co., N. Y. by F. B. Southwick, in an asparagus bed. (Cfr. Peck's Report 50-132.)

Carleton Rea refers the plant to the genus Lysurus and accepts the definition of the difference between Lysurus and Anthurus to be that in the former the arms are distinct from the stem and in the latter they are coalescent with it. This is not the distinction made by the

latest authorities, Patouillard, Burt and Fischer which is that an Anthurus has the spore mass against the inner face (and sides) of the arms whilst in Lysurus it is not borne against the inner face of the arms. According to this definition the plant is an Anthurus. Whether "Anthurus borealis" is the same as "Lysurus australiensis" deponent sayeth not, but thinks it is probable.

We present herewith a figure (74) of the English plant from a photograph from Carleton Rea and also figure (75) of the American plant from a photograph from G. E. Stone.

277—POLYSACCUM BOUDIERI.

It was Vittadini, I believe who first advanced the proposition that European Polysaccums belong to the same species, although the idea has been taken up recently and a formidable list of synonyms compiled. It must be admitted that the "species" can only be distinguished by their general size and shape and that they run into each other in a most perplexing manner. This is true not only of the species of Europe but of the entire world. It is therefore refreshing to find a specimen that seems to differ from other plants not only by having a different shape but other peculiarities. Polysaccum Boudieri (the only specimen known) (see fig. 76) is 8 cm. high and 3½ cm. in diameter. The elongated shape is peculiar to this species as far as I have ever seen specimens, though Nees' figure is same shape. Usually Polysaccum are globose or depressed globose. The peridium is not like other species, a single friable layer but consists of two layers the outer peeling off in the manner of a Phellorina somewhat. This feature plainly shown in our figure is the most important character to my mind The peridioles are friable as in all species but do not crumble as usual. In this plant the walls of the peridioles largely consist of hyaline hyphae and in breaking up these walls "fray out" giving it a cottony appearance. Shreds of these hyaline hyphae mixed with the spores under the microscope appear as though they were short capillitium threads. The spore mass

Figure 76.

is the same color as usual, and the spores as in most polysaccums are globose, rough, varying in size from 8 to 10 mic.

The type specimen is in the collection of E. Boudier, Montmorency, France, and was sent to Monsieur Boudier from the island of Corsica.

278--QUELETIA MIRABILIS

This plant has been described and illustrated in Mycological Notes (p. 135 and plate 10) but we find it of sufficient interest to present another figure of it herewith. This was made from a beautiful specimen in the Museum at Paris, collected by Le Breton.

Figure 77.

Queletia mirabilis is one of the mysteries of the puff-ball world. Only four collections of it have ever been made, and all of them are undoubtedly adventitious, two from France, one in England and one in the United States. The native country of the plant is unknown.

It was first collected at "Port de Sochaux, France." (about 1868) by Perdrizet de Vandoncourt, sent to Quelet, who sent it to Fries, by whom it was described and named.

2nd. It was collected by A. Le Breton in 1884 at St. Saèns (Seine-Infr.) France, "on a large pile of old tan bark." Le Breton sent his plants abundantly to Cooke and they are now at Kew, and he also sent them to the Museum at Paris (see fig. 77).

3rd. It was found by Dr. Wm. Herbst in 1892 (cfr. Myc. Notes p. 135) on a pile of old tan bark at Trexlertown, Pa.

4th. Dr. Herbst sent his material to Kew, and the "packing" was thrown out under a tree near the herbarium building. The next year an abundant crop was collected at that spot by Prof. Massee.

In all these instances the plants grew abundantly but never reappeared the second year in the same locality. If any of my readers can favor me with the record of an additional collection I hope they will write to me.

The fact that two of these known occurrences were on piles of old tan bark point to the conclusion that the spores were introduced in hides from South America (cfr. Myc. Notes, p. 135) but that is not certainly known and the plant is unrecorded from that country.

279--THE NAME POLYSACCUM.

This generic name was adopted by Fries in his Systema, eighty years ago and has been in general use ever since. "Many sacs" is surely as appropriate a name as this genus can bear. The name Pisolithus a few years "prior" has also been known. cited, and rejected by most common sense botanists for a hundred years, no doubt because it is such a false name. Why call a plant "pea-stones" when the "peas" are the most friable and fragile objects we have in the puff-ball family. Modern name changers have recently dug it up, and produce a diagram showing the wonderful fact (which I think was generally known before) that 1805 is an earlier date than 1807. Why do they not dig up the name given it by Micheli "Lycoperdoides" which is eighty years earlier, and make a good job of it while they are about it.

280-AUSTRALIAN FAIRY-RING PUFF-BALL

We have just received an interesting pamphlet from D. McAlpine under the above title. It is an account of a species which reaches us abundantly from Australia and Europe and Prof. McAlpine has given a good account and an excellent figure of it. Unfortunately however, he has misdetermined it, referring it to Lycoperdon furfuraceum on the crude cut of Schaeffer. While there is a possibility that it may have been the original of Schaeffer's cut on account of the shape, the *cortex* is quite different from that which Schaefer shows and there is another plant in Europe with a *furfuraceous cortex* that is generally accepted as being Schaeffer's plant. The plant that Prof. McAlpine illustrates is certainly Lycoperdon hiemale of Vittadini, doubtfully Lycoperdon hiemale of Bulliard and probably Lycoperdon pratense of Persoon.

281--HISTORICAL NOTES.

In investigating the history of the puff-balls in the museums of Europe we find several names in common use not in keeping with historical accuracy. We do not believe in changing names that have become established by use, and we see no reason why the historical truth cannot be told without making it an excuse to change names.

GEASTER FIMBRIATUS.

The most common species in Europe, has been known under this name since the days of Fries' Systema. Fries describes it "without determinate mouth" and that is the character of it. It has so become generally known not only in collections but in books. Several hundred specimens are in the museums so named, and only a few bear any other name. And yet Geaster fimbriatus is Geaster rufescens of Persoon according to all Persoon's specimens. And Geaster rufescens "Persoon" has now acquired a different signification. The plant called Geaster fimbriatus is correctly named and the only object in shuffling it about on the facts would be that it would release the plant now generally known as Geaster rufescens to be described as a "new species."

LYCOPERDON EXCIPULIFORME.

An "excipulum" was a vessel used by the Romans to contain liquids something the shape of a "Florence Flask" of the druggists of the present day. Scopoli, who gave the name, refers to Vaillant t. 12 f. 15 and that figure is well enough shown so that it can be recognized, as Fries has it, as a form of Lycoperdon gemmatum. The early botanists, Persoon. Merat and Desvaux from their specimens and Vittadini from his description applied the name to the plant now called Lycoperdon saccatum (or rather Calvatia saccata) a very common species of Europe, usually this 'excipulum" shape. Recently Hollos applied it to a plant with a fine cortex and almost smooth spores. There is not a particle of evidence to support it. Owing to the past confusion as to the name and the further fact that Vaillant's and Scopoli's plant has a much better name. L. gemmatum, I think the name L. excipuliforme should be dropped.

LYCOPERDON SACCATUM.

Since Fries' Systema which is authority for the name, not Vahl, as usually cited, this plant has almost universally been known under this name, and we favor continuing it. or rather Calvatia saccata, the plant being a Calvatia. Fries cites the characteristic figure "Fl. Dan.' t. 1139" and there has never been any question about the plant or the name since. Some day however, it will be discovered that Persoon described a prior Lycoperdon saccatum which has escaped Saccardo's sweep-net, and then there will be a general juggling about.

GEASTER SCHMIDELI.

Dr. Hollos has changed the above to Geaster nanus, a change that would be very desirable if it were based on truth. The Doctor has probably formed his opinion solely on Persoon's figure, which does not show the pedicel and could well be taken for G. Schmideli, and overlooked Persoon's statement "Le pétiole est tres court et dilaté pour l'ordinaire au dessons du péridie en forme de bourrelet." The Doctor knows the geasters of Europe well enough to know there is but one species, Geaster Bryantii, that answers to Persoon's remarks. It is unfortunate because it would be a better name for the plant. Besides, Geaster Schmideli, while well authenticated by Vittadini's specimens, as well as his figure and description. was originally based on an error as Schimidel never illustrated the plant.

TYLOSTOMA MOLLERIANUM.

I imagine I can see a broad smile come over Bresadola's face when he learns that Hollos states that his Tylostoma Mollerianum is a synonym for Tylostoma mammosum. Bresadola describes his plant as having a plane lacerate mouth and I expect no one knows better than Bresadola that Tylostoma mammosum has a tubular protruding mouth. But Hollos has some grounds for his opinion. He has seen at Berlin Roumeguère's exsiccata purporting to be this plant (and the plant is advertised "Bres. & Roum.") which is undoubtedly Tylostoma mammosum. The same can be found at the British Museum. It has

no resemblance to Bresadola's plant which we have seen at Paris. There is a suspicion in certain quarters that Roumeguére having run short of St. Thomas material filled out his sets with specimens collected in Europe. In other words, that there was a little fraud mixed in the matter.

282--TYPES

Without exception we were afforded the most generous facilities to photograph the various specimens in the Museums of Europe, and we brought home with us photographs of most of the "types" we found. We expect to reproduce these photographs very largely in our future plates, but we shall use the word "type" in a sense not always approved. We consider a "type" an authentic and true specimen of the species from the author by whom it was described, no matter in what Museum it may be. Thus Léveillé sent a specimen of Bovistella paludosa to Kew, which we have photographed and as it is a better specimen than to be found in Paris we shall use it as a "type." Welwitch collected some Geasters in Portugal which came into Berkeley's hands. Berkeley determined them as "Geaster fimbriatus" and sent a specimen to Montagne who described it as Geaster Welwitchii. We consider the plants at Kew, the same plants and the same collection, although they are labeled "Geaster fimbriatus" as much "types" of Geaster Welwitchii as the specimens at Paris. We consider that we have seen most of Vittadini's "types," we have seen his specimens of most of the plants he described, but we have never studied Vittadini's herbarium. There are those who quibble over little technical points about "types" and overlook the main fact that it is not any particular specimen but the species in which we are interested. As long as we present photographs of authentic specimens from the author, and true to the species we shall feel justified in labeling them as "types." It is true that anthors do not always know their own species. and we could cite an instance where an author used a specimen to illustrate his species, that does not belong to the same genus as his "type," but we should not present a photograph of that specimen as a "type" of the species, even though we found it in his own collection.

283—DZA-WAHP-ABE-SAH.

Although this is a very old name I do not propose it as a substitute for Bovista pila, by which the plant is better known to my readers. It is the name given to the puff ball by the Piute Indians of California who employ the spore mass for dusting over the suppurating glands of scrofulous sore neck. They also believe that ghosts paint their faces with it. Thanks to V. K. Chestnut of the Department at Washington for this information.

284—ANTHURUS BOREALIS.

Since this pamphlet has been in type (see p. 183.) Prof Burt, to whom I sent the copy, advises me of another station for the plant. It was collected by F. L. Sargent in low meadow, Westboro, Mass., in 1894.

MYCOLOGICAL NOTES.

BY C. G. LLOYD.

No. 18.

CINCINNATI, O. JULY, 1904.

285—THE GENUS TRICHASTER.

(Plate 17.)

This genus can be described in a few words as being a geaster with a deciduous endoperidium. The general appearance and shape of the plant, the spore mass, the spores and capillitium all are the same as a geaster. Indeed, the few times it has been collected in Germany it was taken for a geaster that had accidentally lost the endoperidium. The genus was described by Czerniaîev from the steppes of Russia in 1845 but he gave no figure of it and the plant was really unknown to modern compilers of books, who either put it among the doubtful genera as it is to be found in Engler & Prantl, or illustrated it as an abnormal form of a geaster as shown by Hollós, who was unaware that he was dealing with Czerniaîev's genus. Czerniaîev sent specimens abundantly to both Berkeley and Fries and when I first saw them at Upsala my impression was that it was a specimen of Geaster fornicatus that had lost its endoperidium by exposure to the hard winters of Russia. I have since changed my mind and I believe now that it is a valid genus and a good species.

The abundant specimens sent by Czerniaîev to Kew and Upsala and the three collections, one in the Museum at Berlin and two in the herbarium of Prof. Magnus all have the same character. The endoperidium is *caducous* and falls away as soon as the exoperidium opens. The exoperidium is not the same as Geaster fornicatus, not only being differently cut but never having the cup at the base which is the *main character* of Geaster fornicatus. I have seen five collections of Trichaster and many of Geaster fornicatus and have never seen them intermixed. If it were an abnormal form, occasionally this form would occur with the normal or vice-versa. In addition Czerniaîev gives the straightforward account of his plant a man does who *knows* what he is writing about. He states that it grows in groups in deep forests and gardens, and develops *on the top of the ground* which he points out "is different from the development of geasters," (as it is from all those that grow with him.)

The plant is evidently abundant on the steppes of Russia* but very rare elsewhere in Europe where only three collections are known. One specimen I found unlabeled in Link's herbarium, collected at Potsdam near Berlin. Two collections are in the herbarium of Prof. Magnus, one collected in the park at Magdeburg, Germany, by Reinhardt, the other in Unterengarten Valley Switzerland by Dr. Magnus.

* Ukraine, the region from which Czerniaîev wrote is in Southern Russia, east of the Carpathian mountains and north of the Black Sea.

Czerniaîev called his plant Trichaster melanocephalus. A somewhat similiar plant, but I believe not published, has been found in Texas by W. H. Long Jr.

286—LANOPILA BICOLOR.

(Plate 18.)

The genus Lanopila was proposed by Fries from a specimen sent him by Wahlberg from South Africa. The type is not in Fries' herbarium, but the genus was well enough described to be easily recognized. It is characterized by the habits and papyraceous peridium of the genus Bovista from which it differs only in the capillitium. This forms a dense, homogeneous, elastic mass formed of long intertwining and branched threads. They are not attached to the peridium.

The genus Bovista typically has short separate threads that can be readily isolated, but that the threads of Lanopila are essentially different, except in being so long and intertwined that they cannot be separated, I think cannot be proved. It is therefore to me a very doubtful question whether the genus should be considered distinct from Bovista, especially as it consists of only one known species,* which is typically a Bovista as to peridium and habits, differing only in this one particular. Lanopila bicolor was described by Léveillé as Bovista bicolor † (Ann. Sci. Nat. 3-5-162) from specimens from India which are abundantly preserved to-day in a jar in the Museum at Paris. It is a very common species in warm countries and we have noted specimens in the Museums of Europe from Brazil, Argentina, Cuba, Guadeloupe, Ceylon, India and Africa.

DESCRIPTION :—The plant is usually 5 to 8 cm. in diameter and subglobose. Peridium is of a reddish brown color and smooth. When young the plant is white and furnished with a thin, smooth cortex which peels off when the plant ripens. The peridium is typically that of a Bovista, papery-cartilaginous and the plant is a typical "tumbler" detaching from the roots when ripe and rolling over the ground. The gleba is compact, homogeneous, reddish brown color, and composed of long intertwined branching capillitium threads. Spores globose, warted, 5-6 mic. without pedicels. The plant is distinguished from most "puff-balls" by the *reddish color* both of the peridium and gleba.

SYNONYMS.

Bovista bicolor (Ann. Sci. Nat. 3-5-162). Bovista pannosa (Jour. Bot. 88-131). Bovista tosta (Jour. Bot. 88-132), Bovista argentea (Ann. Nat. Hist. 3-400). The latter as to specimens now preserved at Kew as its type but they do not answer the description which I think was based on the plant since described as Bovista dealbata. Through a mistaken identification (cfr. Myc. Notes p. 118) this plant has been noticed (p. 118) and illustrated (plate 4, fig. 4, 5 & 6) under the erroneous name "Bovista lateritia". According to an authentic specimen in Museum of Paris Lanopila Argentina (Speg. Argent. 4-100) should also be referred here.

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*Lanopila Wahlbergii (Fungi Natalenses p. 31) unknown. Although the spores are described as fuliginose it is possibly L. bicolor which occurs in Africa. Lanopila stuppea (Sacc. 7-95) =sterile base of Bovistella Ohiensis (cfr. Myc. Notes p. 180). Lanopila tabacina (Michelia 2-565)= Bovista pila (cfr. Myc. Notes, p. 117). Lanopila Argentina (Argent. 4-100)=L. bicolor (vide type at Paris Museum). Lanopila guaranitica is practically unknown.

†Leveille bases the name on the statement "The upper part of the plant is brown chestnut whilst the lower is color of leather." This "bicolor" is not usually noticeable and the plant is really misnamed.

Specimens in our Collection.

West Indies, St. Kitts, Wm. Lunt. a fine collection.
Mexico, Sanderson specimens from Prof. T. H. McBride.
Brazil, Rev. Johann Rick.
Ecuador, G. Lagerheim.

The plants received from Prof. Lagerheim and Rev. Rick are much larger than those from the West Indies and are not globose. The peridium is also separable (as the genus Lasiosphaera) but I think this is due to hard usage in the mails.

287—LASIOSPHAERA FENZLII.

(Plate 19.)

This is the "giant puff-ball" of India, the only species known to me that competes in size with the "giant-puff-ball" of the remainder of the world. Calvatia gigantea.*

The main character on which the genus Lasiosphaera rests is the *caducous peridium*. When the puff-ball ripens, the peridium loosens and falls away, and a mass of compact gleba remains, which rolls over the ground dispersing the spores. Such a mass was picked up thirty odd years ago on the voyage of the "Novara," country unknown, but supposed to be India. It was described in the "Reise der Novara" as Lasiosphaera Fenzlii,† and the specimen preserved in the Hofmuseum of Vienna.‡

Not another specimen has since been received in Europe until last summer when I received at Paris fine specimens from Hugh F. MacMillan, Ceylon and also Geo. H. Cave, British India. These specimens presented every stage from young specimens with the peridium attached, to old ones that had lost their peridia and were only a mass of gleba.

The peridium of the plant is double, both the exoperidium and the endoperidium being thin, the former peeling away from the inner peridium in patches as shown in the plate, and finally they both fall away leaving the spore mass. The inner peridium is very thin and papery, exactly the same nature as the inner peridium of the genus Hypoblema. It is of a rich, chocolate brown color. The gleba is compact, homogeneous, and consists of long, branched, intertwined threads, mixed with globose, rough, spores 5-6 mic. in diameter. It is of the same nature and has the same spores as that of Lanopila bicolor, but the color is not so reddish being rather a purplish umber.(§)

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* The only other I have found mentioned is "Lycoperdon horrendum mihi" (Bull. Soc. Moscow 45-132), but I do not know where "mihi" published it, if he ever did, and it is probable from his incidental mention that it is Calvatia gigantea. The "mihi" writers are now mostly memories of the past, for the idea that a man owns a species because he describes it, was too preposterous to persist. The present system of attaching personal names to the names of plants, is however, a direct outgrowth from it, and its legitimate offspring.

† The generic name Eriosphaera, which occurs in Saccardo was the original Mss. name, not published but changed to Lasiosphaera when it was found that Eriosphaera was preoccupied.

‡ I am indebted to Dr. A. Zahlbruckner of the Museum for a very liberal sample of the type gleba mass.

(§) Statement has been recently made that the plant is the same as the giant puff-ball of Europe but as the two plants have neither the same spores, gleba colors, nor peridia I am not strongly impressed with the truth of it and think the author was guessing.

Geographical Distribution.

The plant is only known from Ceylon and British India. The specimen sent me by Mr. Cave grew on a manure pile.

Specimens in our Collection.

Ceylon, Hugh F. MacMillan, *British India*, Geo. H. Cave.

288—THE GENUS SCHIZOSTOMA.

(Plate 20.)

A misunderstood genus from the day it was proposed by Ehrenberg, *I consider it a valid genus, certainly as distinct from Tylostoma, as the genus Chlamydopus. I do not take it in the sense it is found in Saccardo, as a section of Tylostoma, for it includes but a single species, Schizostoma laceratum. This plant, the type specimen of Ehrenberg† is found in the Museum at Berlin, also abundant specimens collected in recent years by Schweinfurth in Africa. It is in no other museum to my knowledge.

The genus Schizostoma, differs from Tylostoma in the nature of the peridium. This is very fragile, and dehisces in the manner of a Calvatia by an irregular breaking up of the upper portion. It is given in Saccardo as a section of Tylostoma, including the species with "irregular mouths" but the genus Schizostoma has no mouth.

Fries, who had seen Ehrenberg's plant, referred it to Tylostoma, and Léveillé who I think never saw it, had a mistaken idea of it. He restored the genus, and included all species of Tylostoma with irregular mouths. It is Léveillé's genus Schizostoma, that in Saccardo is classed as a section of Tylostoma.

SCHIZOSTOMA LACERATUM.

This plant which is the only species of the genus, is only known from Equatorial Africa, but has been collected abundantly in recent years by Schweinfurth, whose specimens are at Berlin. That it probably does not occur in Northern Africa I infer, from the fact that it is not found in the museum at Paris, especially rich in North African plants. The plant has a close resemblance to a Tylostoma and could be well classed with this genus.‡ To my mind, the difference between it and Tylostoma is the same as between Calvatia and Lycoperdon. The upper portion of the peridium breaks away in pieces and does not open by a definite mouth.

The stem is long, cylindrical, and inserted into a socket at base of peridium as in a Tylostoma. While the plant certainly has a veil in the young condition, there are but few indications of it in the mature plant. The peridium is brown, very thin, the upper portion breaking irregularly away when the plant matures. The gleba is a rich *brown*

*I have not seen the original publication "Nees Horae physicae berolinenses," as cited by Fries, and I do not know whether it was published or was only a mss. name as stated in Saccardo.

† I neglected to note whether Ehrenberg gives gives a locality but think not.

‡ There is no serious objection to classing it as a Tylostoma, as the amount of difference necessary to constitute a genus is entirely a matter of individual opinion and cannot be defined by rules. But there is a strong objection to classing it in the section with Tylostoma volvulatum. granulosum, etc., for (notwithstanding Hollós thinks it is the same as volvulatum) it differs from all these plants much more than they do from the other "section" of the genus.

color different from what is usually found in species of Tylostoma (excepting T. volvulatum).*

Capillitium long, tortuose intertwined, deeply colored, sparingly branched threads.† They are not septate and are about twice the thickness of spores. Spores globose, 4-5 mic. finely warted.

SYNONYMS.

Tylostoma laceratum (Fr. Syst. 3.44), Tylostoma Schweinfurthii, (Eng. Jahr. 14-359), Tylostoma Kärnbackii, (Mss. name).

289—BROOMEIA CONGREGATA.

(Plate 21.)

This is a very curious genus, known only from South Africa, and but one species.‡ It was well described by Berkeley (Hook. Jour. 44-185) and beautifully illustrated by Fitch. It has been collected a number of times in South Africa, always correctly determined owing to the splendid initial work accomplished, and fine specimens can be found at Kew, Berlin, British Museum and Upsala.

The little plants which are very numerous (sometimes 150 individuals in a cluster Berkeley states) are imbedded side by side about one-fourth their height, into a common stroma. This stroma is of a firm, corky nature and flesh color. It grows on rotten wood, and the clusters can be aptly compared to a water lily pad (Nelumbium luteum). We have seen no young specimens, or specimens on which any portions of the exoperidium remained ? George Murray gives an excellent account of the outer peridium (Jour, Linn. 20-311) "It is a beautiful white color, joined to the stroma round the margin and reaches over the tops of the inner peridia. Each individual is not completely invested by it, at all points, but it extends over the tops as one continuous membrane, common to the whole mass fitting into the depressions between the inner peridia, and, in the cases of nearly mature individuals, easily separable from them."¶

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*The color of gleba of Schizostoma is "castaneus" chestnut brown. That of Tylostoma is close to "isabellinus" tan color.

† The gleba nature of the genus is different from that of Tylostoma. The long, intertwined threads bind the mass together, as in Calvatia craniiformis, and in herbarium specimens, the gleba remains in place, although the peridium has broken away. In Tylostoma and most genera opening by a definite mouth the gleba is less cohesive.

‡ Leveille described a Broomeia guadalupensis from the West Indies. No one else ever found the genus except in South Africa. The locality "Albany Amer. Bor." in Saccardo is an error for Albany a district of Cape Colony. Diplocystis Wrightii, a somewhat similiar plant (cfr. Myc. Notes, p. 141 and plate 15) is common in the West Indies. and known from Guadeloupe. Leveille's species, Broomeia guadalupensis, is almost certainly the same as Diplocystis Wrightii and an earlier name. It would be safe to say so anyhow as Leveille's specimens are lost and no one could prove to the contrary and it is an elegant opportunity for some name juggler. The specific name, congregata, is very appropriate but I do not know what Broom had to do with it If Berkeley had named the plant "Fitchia" after the man who made the fine drawing of it which in reality made the plant known, it would have been far better. Whether "Broomeja" as found in Saccardo or "Broomeia" as originally spelled, is orthographically correct I do not know.

? On the herbarium sheet in British Museum is a memorandum "see specimens in a box." These specimens no doubt show the exoperidium. I intended to ask for them, but through neglect failed to do so.

¶ We hope this article will reach the notice of some South African botanist. who will appreciate how anxious we are to have some specimens in our Museum and favor us by sending a nice collection. We especially hope for some young specimens showing the outer peridium before, or while it is breaking away, as we would wish to present a photograph to our readers.

The separate plants lie almost contiguous. The peridia are dark brown, in color, and strongly marked each with a determinate fimbriate mouth. The capillitia are colored, long, tortuose threads which are irregularly bent and thickened. They appear to me unbranched. Spores subglobose, finely echinulate, 6-7 mic.* The fresh plant according to Berkeley "exhales a strong scent of aniseed." That the odor is strong we judge from the collection notes of MacOwan "Non oculis sed *naso* detexi."

BROOMEIA AND DIPLOCYSTIS.

When we wrote on Diplocystis (p. 141) we had never seen Broomeia and really did not know the difference between them. When we became familiar with both plants it became evident that there is no great resemblance between them excepting that both consist of numerous individuals growing gregarious on a common stroma. The stroma of Diplocystis is flat, rather thin, and dark in color. That of Broomeia is thick, convex, and flesh colored. The exoperidium of Broomeia is universal to the cluster; that of Diplocystis individual to each plant. The mouth of Broomeia is strongly determinate; that of Diplocystis indeterminate. The capillitia of the two are quite different. The illustration in Engler and Prantl of Broomeia, from the drawing of Fitch is excellent. The "original" illustration of Diplocystis in the same work is inaccurate.

290--BATTAREOPSIS ARTINI.

(Plate 22.)

This is one of the recent additions to the genera of Gastromycetes described and figured by Dr Hennings in Hedwigia 1902. Only one specimen is known which grew under abnormal conditions and was probably modified by its surroundings. It was found at Alexandria, Egypt under an asphaltum pavement two inches thick which it had raised up by force, a circumstance so unusual that the specimen was put in alcohol and sent to Berlin. There it was found to belong to an undescribed genus All that reached Berlin was the volva, stem, and cap covered with gleba. The peridium nature, if it possesses one, is unknown. The plant has a general resemblance to a Battarrea but it is quite different in the nature of the gleba. This is composed of cells filled with spores, somewhat of the nature of the gleba of a Polysaccum but the cells seem to be formed of plates with partitions. The color of the gleba is similiar to Battarrea and the spores are similiar, but the plant has none of the "annulated cells" of that genus. The capillitium is scanty and appears to me to be part of the hyphae of the walls, rather than free threads mixed with the spores.

We present a photograph of the volva, stem, and cap (the latter two views). But we shall not attempt to reconstruct the plant. Dr. Hennings tells me the figure in Hedwigia was arranged according to a sketch sent with the plant, but there is no scar on the concave side of the cap, which I think would be the case if the stem were so attached. It is a most interesting plant and we hope additional specimens will be found in natural habitat so that more can be learned about it.

* These dimensions differ from those given in Saccardo.

291--GYROPHRAGMIUM AND POLYPLOCIUM

I think that anyone who will study the types of Gyrophragmium Delilei at Paris and Polyplocium inquinans at Kew will reach the conclusion that the two plants are co-generic. The only question to me is if they are not co-specific. They were published practically at the same time and I do not know how the question of priority of generic name will be decided. The plate of Polyplocium inquinans was published first, then came the description of Gyrophragmium and then the description of Polyplocium. I believe according to "rules" Gyrophragmium stands, but whether it does or not, I shall adopt it for several reasons.

1st. I think both authors thought their genera were practically the same, and each was hurried to get his name attached to it. Each labored to show that his genus was different from the other, and so well succeeded that the two genera have been carried in all compilations down to the present time.

2nd. My sympathies are with Montagne for he received his plant several years before Berkeley, but he lost time in sending his specimens to Fries * and Berkeley as soon as he received the plant issued a named plate. When Montagne saw Berkeley's plate, he came out at once with the description of the genus Gyrophragmium before Berkeley had a chance to publish his genus.

3rd. Gyrophragmium Delilei is not a rare plant in the Mediterranean countries and has been published and recorded a number of times under this name. Excepting a determination made by Harkness, the name Polyplocium inquinans has never been applied to a collection save the original specimen of South Africa, sixty years ago.

4th. I think the genus Polyplocium although well illustrated, was misdescribed as having capillitium mixed with the spores. I am unable to find any capillitium and think the character does not exist.†

RELATIONS:—To my mind the genus Gyrophragmium has no place in the Gastromycetes. Its relations are more close to the Agarics. It is a connecting link between the two passing on one hand through Montagnites to Coprinus and on the other through Secotium to the true Gastromycetes. Montagnites and Gyrophragmium are very close genera and sometimes confused. Both have dark, almost black spores, borne on basidia, and lining "tramal plates". In Montagnites the plates are radiately arranged as an Agaric, and can be well called gills. In Gyrophragmium, they are strongly, convolute and sinuate, forming by their sinuosity "pore-like" chambers.‡ These are pores not closed excepting imperfectly, the tramal plates lying close to each other at their lower extremities. They do not form true cells. Montagne's figure (copied in Engler & Prantl) shows the plates too regularly and serially arranged. Berkeley gives a much better figure of the plant.

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* Attention of priorists is called to the fact that the plant was first published by Fries as Montagnites Dunalii (Epici '-240) having been sent to him by Montagne under the name "Agaricus ocreatus Delile Mss." This naturally provoked Montagne not a little, for the naming of a "new species" unasked, by one author from specimens received from another writer on the same subject is not held to be good form Besides, Fries got the French names mixed, Dunal had nothing whatever to do with the plant.

† I am aware that Corda in his figure, plainly shows the capillitium. but I think he made up his drawing to suit his ideas of what he thought ought to be. Corda's figure is a copy of Berkeley's with the addition of a cut showing the "capillitium."

In Saccardo the character "Capillitium filamentosum" is given as the key character of the genus.

‡ Mr. L. A. Greata, Los Angeles, Cal. has favored me with an account of the structure of a young plant, from observations of a fresh specimen. "A cross section, at first sight would appear irregularly porous. A close examination however. shows lamellae densely crowded and pressed, much the same as you would obtain on a large scale by laying a number of thin damp cloths, one on top of the other and then holding them perpendicular and squeezing one end tightly into a circular form. There is only this difference, the lamellae are broken up into short pieces and do not seem to reach from the the stem to the periphery.

GYROPHRAGMIUM.

There is little description needed for this plant other than the photographs on our plates. The gleba is described above.

The plant usually grows in sandy places. Its true home is the "sand-dunes" on the Mediterranean coasts. The young plants are enclosed in a volva (or peridium, if we call the plant a gastromyces). This breaks irregularly as the plant grows. In the European form it usually remains as kind of volva cup (see plate 24 fig. 3) at the base of the plant In the American plant it generally breaks loose from the base of the plant, though fragments are sometimes attached to the stem as shown in our figure. The tramal plates and spores (gleba) are black. The flesh of the stem in dried specimens is yellow. We do not know the color when fresh but Mr. Greata writes me, " upon cutting, the flesh of the stalk rapidly *turns* a bright lemon yellow." The European plant is decidedly more yellow than the American plant.

All Gyrophragmiums that I have seen impress me as being forms of the same species, having practically the same gleba and spores and would probably all be better called Gyrophragmium Delilei. The European, American and South African plants present minor differences, chiefly stature, and it is perhaps well for the present at least to designate them by separate names which have principally a geographical significance.

292—GYROPHRAGMIUM DELILEI.

(Plate 24. Figs. 3 and 4.)

The original form from Montpelier France, has been found in Algiers, Sardinia and no doubt occurs in other Mediterranean countries. It is a brighter yellow than other forms and the volva usually (not always) persists as a cup at the base of the plant. Spores subglobose, 6-7 mic.

Specimens in our Collection.

Sardinia, F. Cavara, *France*, N. Patouillard.

293—GYROPHRAGMIUM DECIPIENS.

(Plate 23.)

The West American form, varies much in general stature, and we have seen specimens as slender as the European form. As it grows in the sand-dunes of the Pacific Coast it is a much more obese plant, with a thick stem. The volva does not usually form a cup but breaks away from the base of the plant. The spores 6-8 mic. are slightly larger than the European species.

HISTORY.

Originally collected by Harkness it was sent to Cooke and referred to the South African form. Polyplocium inquinans. Recently it was described (Bull. Tor. 95-492) from Southern California as Secotium decipiens. Polyplocium Californicum I think is a slender form of it.* Podaxon strobilaceus (Ann. Myc. .02-4) is probably a slender form of it.†

Specimens in our Collection.

Los Angeles, California, L. A. Greata (abundant), *San Bernardino*, S. B Parish.

294—GYROPHRAGMIUM TEXENSE.

(Plate 24, Fig 5.)

This plant described (Grev. 2-34) as Secotium Texense is certainly only a small form of the Pacific Coast plant and probably grows continuously through the desert to lower California. The specimen we have received from Mr. Long is smaller, more scaly and the spores slightly smaller (5-6 mic.) than the western form.

Specimens in our Collection.

Texas, W. H. Long, Jr.

295—GYROPHRAGMIUM INQUINANS.

(Plate 24. Figs. 1 and 2.)

Only one specimen of the plant is known. It was collected in South Africa sixty years ago by Zeyher, described as Polyplocium inquinans and is preserved at Kew. It is more robust than the North African species and the tramal plates (of this specimen) are more twisted together, and separate from each other so that at first view it appears quite different. The structure however, is essentially the same. The spores are slightly more oval than the North African form, but the contrast is not very great as shown by our silhouettes and the spores of no species are truly globose.

296—ANTONY GEPP.

My apologies are due and are extended to Mr. Anthony Gepp of the British Museum for misspelling his name "Jepp" in our last issue. He was very kind to me and I am sorry to have made such a mess of his name. It is one of the features of the English language that one can never tell how to spell a name from the way it is pronounced. Leister should also have been Lister.

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* Dr. Harkness was not very careful in distributing his specimens. The specimen in New York from him is a Gyrophragmium. The specimen at Berlin a Montagnites. On the strength of this specimen Dr. Hollós refers Polyplocium Californicum as a synonym for Montagnites but it is quite evident that Harkness' description does not refer to that genus.

† The author, E. B. Copeland, has apparently such a slight knowledge of the characters of the genera of these plants that it is difficult to tell from his description to what genus his "new species" belongs. From his figure and also his description of "pendant, hymenium coated plates" it is probable his plant is a Gyrophragmium. Certainly it is not a Podaxon and has not the most remote resemblance, or the slightest character belonging to this genus. It is a sad commentary on the competency of "new species" makers when their work shows such lack of elementary knowledge of the "old genera".

297—GEASTER BERKELEYI.

Those who express opinions second hand, regarding plants about which they really know nothing, are very apt to make mistakes. When we took up the subject of "puff-balls" we thought it a crime for a man to make a mistake and that he ought to be crucified for doing so. Our opinion has somewhat changed, first, because so many

Fig. 78.
Geaster Berkeleyi.

mistakes are made, that were this plan adopted there would be very few mycologists left, and second, we are among those who make mistakes, and are not seeking that kind of a death. We think however, that there have been surprisingly few errors in Mycological Notes. The most serious one known to us is where we referred Geaster Berkeleyi to Geaster asper from our book studies of the plant. As soon as we saw the plant we noted our mistake, for the two have little resemblance.

Fig. 79.

Geaster Berkeleyi (fig. 78) seems to be a very local plant. We have seen no specimens excepting from England and Australia. A small form of it (called Geaster pseudo striatus*) [see fig. 79] grows in Hungary.

* Before we knew Geaster Berkeleyi we refered that little form to Geaster asper.

298--Minor Errors.

Every line written in Mycological Notes is original. I do not compile or copy. Such mistakes as occur are my own. My aim is to first learn my subject and then write it off-hand. In so doing I not infrequently transpose names, and in looking over published work I sometimes notice errors of this nature. For example the following are to be cited: "Geaster lageniformis" Geastrae p. 11, for Geaster floriformis, "Nidularia striatus" Gastromycetes, p 10 and fig. 19 for Cyathus striatus. "Bovista debreceniensis" p. 171 for Globaria debreceniensis. "Geaster stellatum" p. 171 for Lycoperdon stellatum. "Diploderma indicum" p. 181 for Diploderma tuberosum. These errors are all incidental in the text, and are self evident on their face. No doubt if I should compile my work from books in front of me, fewer mistakes of this kind would occur.

I published that the proper spelling was Secotium rubigenum not Secotium nubigenum. That was a mistake of mine, not an unintentional slip as the previous. In the New York Botanical Garden I read the label of Harkness' specimen Secotium rubigenum, and thought it correct, as I connected it with the word rubus and supposed it referred to the red color of the plant. I took Saccardo's spelling Secotium nubigenum as a typographical error. It is not as I have since learned. The plant was originally so published.

In the last issue there are a number of proof reader's errors as "Schimidel" for Schmidel and the expression "No less than sixteen different collections of the little pine-woods species *is* in the British Museum" should not have been overlooked.

299—A Conidial Spored Gastromyces.

A great many fungi under certain conditions or at certain stages develop conidial spores. It is very common in the Tremellinae, well known in the Agaricineae. the Polyporae etc. We believe, however, there is no record of conidial spores in the Gastromycetes.

The perfect forms of all Hymenomycetes (and Gastromycetes are not exceptions) bear their spores on special organs called basidia. These are the normal spores of the plant.

Many fungi however, in addition to these basidia spores, produce spores which grow on the hyphae forming the tissue of the plant. These are called conidial spores.

There is in the Museum at Paris a small fragment of the type of Catastoma juglandaeformis.* As soon as I looked at the spores I noted that the long peculiar pedicels (fig. 80) were entirely different from those of any other specimen of the genus I had ever seen. They are unusually long, they are colored, they are uniform in thickness, and blunt at the ends. They are in every respect similiar to the capillitium threads with which they are mixed.

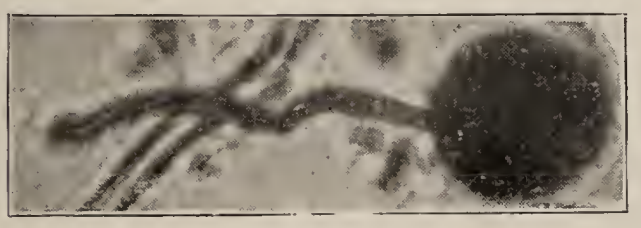

Fig. 80.

* Bovista juglandaeformis (Jour. Bot. 88–130).

When I went to Kew I took the matter up with Prof. Massee and told him there was "something wrong" with the spores of this plant. He made a microscopic mount and on the first slide he *found a spore in situ, articulated on to a thread of the capillitium.* This proved their nature without a question I have since several times tried to make another mount but never succeeded, as the spores break off so easily, it is difficult to prepare a slide without breaking them off.

Catastoma juglandaeformis is know only from South Africa* and but two collections, one now at Kew, the other, locality unknown, at Berlin. We judge from the "picture" of Bovista hungarica recently described, that its spores are of the same nature.

300—THE LOGIC OF NAME JUGGLERS.

Dr. Hollós writes by the column on the "rights of priority" when he think he sees an opportunity to juggle up a new combination and add the word "Hollós" to it. Secotium acuminatum has been generally known under that name for many years and Dr. Hollós so published it several times and his specimens of the plant so labeled are found in Berlin to-day. It is the only name he ever knew for it before he began to look up dates of the synonym in Saccardo. Then he reached the conclusion that he could do a little juggling, and he got a little advertisement by calling it "Secotium agaricoides (Czern.) Hollós".

But he takes the strange stand, for one who uses "priority" as his chief excuse to juggle names, that Secotium erythrocephalum, which he claims is the same plant and an earlier name, cannot be used because it was based on young specimens of the plant. There is logic! Any kind of an old vague picture serves him as an excuse to change names, if he can write "Hollós" after the "new combination" but he holds that he must not use Tulasne's earlier name, because Tulasne had young specimens. So he conjures up a *subsequent* name, and devises a new combination, to which the word "Hollós" can be added. The editor of the "Annales Mycologici" mildly take the doctor to task for it because he takes Hollós' synonym as true and the editor knows that 1844 is an earlier date than 1845. The whole subject is a farce, especially in view of the fact that when Dr. Hollós states that Secotium erythrocephalum is a young form of the European species he is only guessing. He never saw the New Zealand plant. It has little more resemblance to the European and not a great deal more relationship than an elephant has to a rhinoceros. Why spoil good white paper and waste printer's ink discussing the proper plant name on such statements as these?

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* The plant called Discisceda Hollosiana (Hedw. 02-62) which is exactly the same plant, to the most minute detail, was supposed to come from Mexico but that is probably an error, as we shall explain in detail when we come to consider the genus Catastoma.

301—MICRO-PHOTOGRAPHS.

The micro-photographs that we present in our plates are not good. Ordinary photography is simply mechanical and requires neither much skill nor experience, but in making high power micro-photographs of opaque objects difficulties are met that we have not as yet been able to overcome. We present them because they show *shape* and *size* exactly but they are little more than silhouettes and are of value only in contrast.

For example. Compare our micro-photograph of the spores of Secotium macrosporum (Plate 13, fig. 16) with that of Secotium acuminatum (Plate 13, fig. 11) and a contrast will be seen, that words cannot convey.

Besides they can be measured accurately as each *millimeter* represents a *micron* and there is little room for error. But the surface markings are an absolute failure.

We have taken this matter up with an authority who "wrote a book" on the subject. He kindly tried to help us out but his prints were not as good as our own. We also placed the subject in the hands of a firm in London that makes a business of micro-photography. They returned the material and acknowledged that they could not give us what we wanted. If any of our readers can make a micro-photograph of an opaque object, with a high power lens, an even magnification of a thousand, and show not only shape and size but *surface* we hope they will come to our aid.

302—MITREMYCES RAVENELII IN JAPAN.

We have received from T. Yoshinago, Kochi, Japan, two collections of Mitremyces Ravenelii, exactly the same plant we have in the United States (see Myc. Notes, p. 126, plate 9). Both collections were made at Mt. Ushioe, Tosa, one by M. Gōno, the other by K. Nakanishiki.

A record of this species in Japan was made in "Nature" within a year or two and the same plant from Japan has also been recently described as new species.* I found in the Museum at Berlin specimens that were collected at Nagasaki by Schottmiller in 1860 but they were undetermined until recently.

Fig. 80.

On comparing our cut herewith of the Japanese plant (Fig. 80) with the figure on plate 9 of the American plant it will appear that the plant is smaller and has less development of the root fibers. Our figure on plate 9 was made from an unusually fine, large specimen, the figure herewith gives a better idea of the plant as it usually reaches me from my American correspondents. The type specimens at Kew are also about this size.

* Calostoma japonica (Eng. Jahr. 1902).

It seems to me some hair-splitting was done when "Calostoma microsporum, Atkinson, new species," was recently launched. The spores of all the elliptically spored species of Mitremyces vary in size even in the same specimen (see micro-photographs, plates 8 and 9). In figure 6, plate 9, are shown three spores side by side, one 15 mic. long, another 10, one 4½ mic. thick, another 7. To base a new species on slight spore variation in a genus where no two spores in the same specimen are the same size, seems to me useless.

303—MITREMYCES "LUTESCENS" IN THE MUSEUMS OF EUROPE.

Although there are abundant specimens labeled "Mitremyces lutescens" in the museums at Upsala, Paris, Kew and the British Museum, in the entire lot I have found but a single specimen correctly labeled. Most of them came from Ravenel and Curtis who always labeled cinnabarinus and sometimes Ravenelii as lutescens. Berkeley in his early days had a correct idea of the characters of lutescens, as is evident in his remarks when he described Mitremyces fuscus, (Ann. Nat. Hist. 1839), but in the course of years the distinction passed from his mind and he placed in his herbarium during later years, unchallenged, the many misnamed specimens received from Curtis and Ravenel.

Finally, the matter became so confused in Europe that one author makes the statement "The remarkable diversity of appearance presented during different periods of development has been the cause of several mistakes; even Schweinitz did not know the plant in the young condition."

In the above quotation as well as in the foot note Myc. Notes, page 125, an injustice has been done to Schweinitz. In his writings as I have previously stated, Schweinitz is certainly clear as to the distinction between Mitremyces lutescens and Mitremyces cinnabarinus. It is the later writers who are confused. In Schweinitz' herbarium to-day Mitremyces cinnabarinus is labeled Mitremyces lutescens (cfr. foot note p. 125) but his collection was rearranged and mounted, some years ago, and it is probable I think that the labels were changed then. Schweinitz certainly knew the difference.

I found many specimens in the Museums of Europe labeled "Mitremyces lutescens" but only one is attributed to Schweinitz. This one is in Hooker's herbarium at Kew, and it is the only one of all the many specimens that I found in Europe that is *correctly labeled*. I feel an apology is due to Mister Schweinitz.

304—AN "ALBINO" GEASTER.

Among a number of species sent me by James Fletcher, Ottawa, Canada, was a fine lot of Geaster triplex. It is a species very common in the northern portion of the United States and Canada (cfr. p. 104) and when we received the specimens we noticed nothing peculiar about them. Mr. Fletcher calls to our attention that the spores of some are almost white. We find that to be the case, not only the spores but the

inner peridium. The light colored peridium probably would not have attracted our attention for the inner peridia of many Geasters bleach out on exposure to the weather. But the color of spores does not bleach. We can offer no explanation of it other than to advance the theory that they tend toward albino forms. They grew with ordinary forms of Geaster triplex with the usual reddish peridium and sooty spores. They are the first "albinos" we have ever noticed in the puff-ball world.

305—CALVATIA SCULPTUM.

Several years ago while calling on the late Dr. Harkness at the rooms of the California Academy of Sciences, San Francisco, I was shown a specimen of the remarkable plant he described as "Lycoperdon sculptum."

It was so strongly marked and such a fine species that I have always wanted to own a specimen. At last my desire has been gratified, through the kindness of Prof. Walter C. Blasdale, who sent me a small but very fine example (fig. 81). It reached me during my stay at Paris, and I was pleased to show it to my friends Patouillard and Hariot. I think they were both desirous of it, but of course I could not spare it.

Fig. 81.

This plant is covered with large pyramidal warts known to no other "puff-ball." It was described as a Lycoperdon but its generic position is not assured. It seems to me to more closely approximate Calvatia in modern classification but will probably be made in time the type of a separate genus.* The method of dehiscence is I think not surely known. Prof. Blasdale writes me:—"I do not recollect the manner of dehiscence but am sure that the peridium breaks into pieces and the spines peel off as it dries."

There is at Kew some ripe gleba sent by Dr. Harkness. It is unusually bright yellow in color. The small, smooth spores and thick, deeply colored capillitium threads are very similar to those of Calvatia caelata. The plant does not grow near the coast, we understand, but is only found in the Sierra Nevada Mountains. Prof. Blasdale collected it at Lake Tahoe. We hope some one who is fortunate enough to live in these mountains will collect it more abundantly for us. The specimen received is a small one. The one in the Museum in San Francisco is five or six inches in diameter.

* This is a hint to some one ambitious of the "honor" of proposing new genera. The genus "Areolaria," to which it has been suggested this plant belongs, is a bad mixture made up in Saccardo of a Calvatia a Phellorina and a Scleroderma.

306—"LYCOPERDON" KAKAVA.

Just sixty years ago this plant was "described" but in the intervening time not a word of additional information has been added to it. There is a specimen in the Museum of Paris from which our figure 82 has been made. Without regard to the collector's notes the plant would not now be called a Lycoperdon, differing in the gleba and in its mode of dehiscence. The latter appears to be similar to a Calvatia. The gleba is olive-brown and differs from Lycoperdon in the almost entire absence of capillitium. The spores are small 3 mic., very rough, angular, globose.

Fig. 82.

The specimen was collected at Mount Gede, Java, by Zippelius who states: "The peduncle is furnished with a red membrane which encloses a viscid, lead-colored mass."

If this is true, of course, the plant is no Lycoperdon. No trace of this "membrane" is found on the specimen as it exists to-day. The botanists of Java are quite active these latter days, and some one should look out for this plant and give a good account of it. It is undoubtedly a "new genus."

307—MITREMYCES CINNABARINUS.

Probably the first specimen that ever reached Europe is found to-day in the herbarium of Desvaux in Museum of Paris. Except the "hab. Am. Bor." there is nothing to show the source of it. Persoon first described it and his figure is so perfect of Desvaux's specimen, that there is no doubt it is the identical plant he described. The next man to consider it juggled Persoon's name off of it, and since although the plant has been several times named and juggled, poor old Persoon never got any further advertising out of it. Persoon made a guess about the plant that is worth repeating as a curiosity. "This plant has its orifice colored a beautiful vermilion. One notes this color also though feeble in the roots. This makes one think that this vegetable grows in the neighborhood of cinnabar mines."

A COMPILATION

. . . OF THE . . .

VOLVÆ

. . . OF THE . . .

UNITED STATES.

C. G. LLOYD.

CINCINNATI, 1898.

W. G. FARLOW

INTRODUCTION.

There are hundreds of botanists in the United States going over the same old ground year after year, flowering plants, when a practically unexplored field lies at their very doors. The study of the larger fungi, especially Agarics, is suffering for want of careful workers, and to-day, except in a limited field covered by Prof. Peck in the East, is practically unworked in this country. The chief difficulty is in a lack of literature. Little has been published on the Agarics of this country, save the numerous new species described by Prof. Peck and others, and these descriptions are so scattered through various publications that they are not available for the ordinary workers. Agarics should be studied by contrast and comparison, not each one as an isolated fact. We have several local lists, such as Johnson of Minnesota, Harkness of California, but they are for the most unreliable, and it were better for the science had they never been issued. It is to make a start to supply the literature needed that this pamphlet is compiled. It contains a synopsis of all the European species of Volvæ reported from this country (a number no doubt errors) and all the "new species" described from this country. Many of the "new species" are based on colored plates or dried specimens sent to Europe and we opine that reliable work can not be done with such material. Agarics must be studied *fresh* and in the woods where grown, and it will be many years before the errors of our "dried specimen" descriptions of "new species" are eliminated. It is a fortunate circumstance to help the beginner in the study of our Agarics that the most of them are European species, and further that Europe has had a *Genius*, **Elias Fries,** who mastered the agarics of Europe and left us the result of his work in a completed form. (Epicriseos Systematis Mycologici, 1874.) We advise every one who wishes to take up the study to obtain first a copy of Stevenson's British Fungi, (2 vols., 1886,) the best work ever issued in English, and next (if possible) a copy of Fries' work mentioned before. Stevenson's work is largely based on Fries and the American worker can with Stevenson alone, determine a large number of the Agarics he may meet. You will find many difficulties in your path, but you are needed in the work, and if a number of botanists in different sections will undertake to make a careful *study* of their local mycological flora, not contenting themselves to be mere collectors of dried specimens, but *students* in the *woods* making notes, descriptions, comparisons, contrasts, of the Agarics they meet, from their observations on the *growing plants,* it will not be many years until we can have a systematic American work of value on the subject.

C. G. LLOYD.

VOLVÆ.

The tribe "Volvæ" is characterised by the young plant being enclosed in a thick membrane, called a volva. (See Fig. 1.) This is the theoretical character, practically, it is of little service, as most species pass this stage of their life beneath the ground, and the volva is ruptured before it peeps up out of the earth.* Yet after a little observation, you will recognize a specimen belonging to this tribe, by the *remains* of the volva which you see. If you find an agaric with slightly attached scales (or warts as they are generally called) on the pileus, (see note,°) or if you find a cup at the base of the stipe, (as fig. 2, p. 3,) or if you find scales at the base of the stipe (as fig. 5, p. 5) or scars where the scales have fallen off, (as fig. 6, p. 6,) your plant most probably belongs to this tribe.

Yet, there are many agarics† that have volvas‡ more or less pronounced and we must have some other way to limit the tribe.

In the first place, the tribe Volvæ belongs to the old genus Agaricus, as limited by Fries, viz:—The plants are soft and fleshy, they do not revive when dried—they are not tough, persistent or coriaceous. The gills are entire, thin, sharp—and not deliquescent when old. From the other tribes of the old genus Agaricus, the following is the technical distinction.

Hymenophore distinct from the stipe, and universal veil discrete from the epidermis of the pileus.°

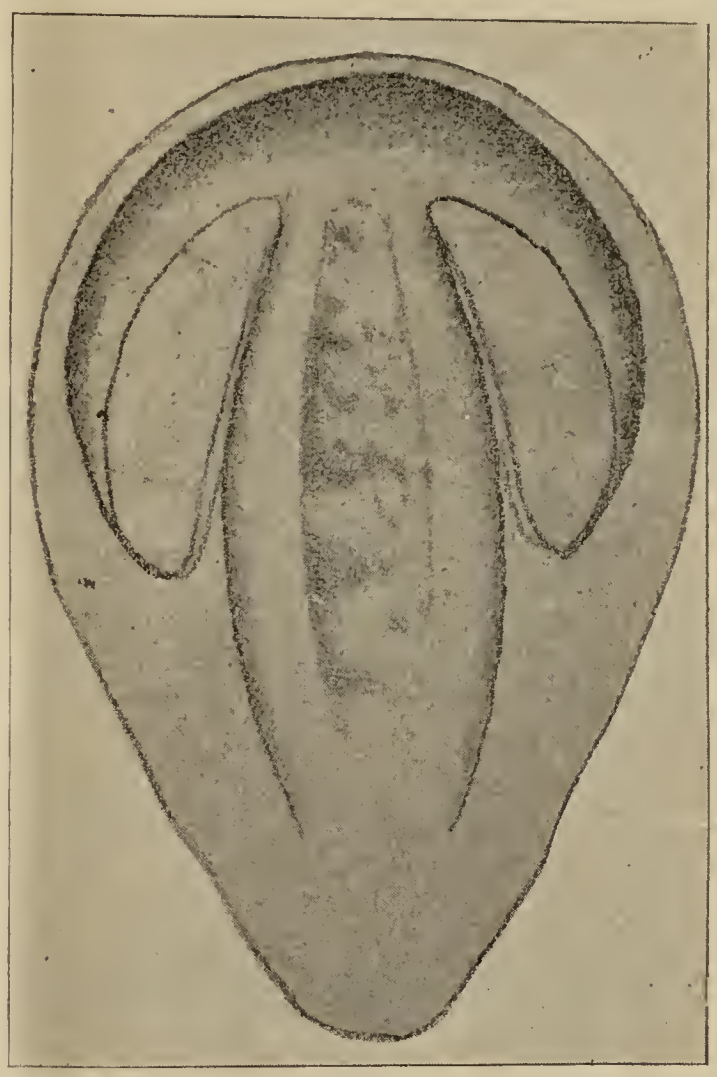

Fig. 1.—Section of a young Amanita in the volva.

*The books on edible mushrooms will tell you with great gravity, to always avoid eating a species where you find the young enclosed in a shell like an egg. It is good advice—but they are usually young phalloids which no one need be guarded against eating when mature. If you find an agaric in the egg shape, it is most probably Amanita cæsarea, (an edible species, but my advice is *don't eat any Amanitas, and you will make no mistake,*) or Volvaria bombycina. Other species usually break their volvas before they appear out of the ground.

†The name agarics is a general term which we would apply to all fungi bearing gills, the genus Agaricus of the old botanists, and not restricted as limited by Fries.

‡*Coprinus picaceus* has a volva as evident as any Amanita. It breaks into scales on the pileus the same as an Amanita. Most *Coprinii* indeed have remnants of a volva, the micaceous particles on the pileus of the common species *micaceus*, the hairy covering of *fimentarius*, the scurfy particles which we see on the pileus of most other species are in the nature of a rudimentary volva. Likewise the dense coat of gluten covering young *Lepiota oblita*, *Pk.*, the white granules of *Lepiota cristatella Peck*, the thick gluten of many *Hygrophorii* and *Cortinarii* are morphologically volvæ, though rudimentary. On the other hand some species of Amanita as *lenticularis* and *granulosa*, the volvæ are no more evident than in the cases cited above.

°These two terms will not convey much meaning to the beginner. The first means that the substances of the pileus and stipe are different, that they are not homogenous—hence the stipe is easily separable from the pileus, that it can be easily pulled out. It is also the case that the gills are free, that they are not attached to the stipe, though a few plants that have pileus and stipe homogenous have free gills. The second term means that the scales of the pileus are not a part of the epidermis. The beginner finding a white spored specimen with scales, may be puzzled to know whether it is an Amanita or a Lepiota. The scales, or warts may be easily differentiated. In Amanita they adhere (generally loosely) *to* the pileus, they can be pulled off without breaking the skin. In Lepiota they are the loose edges where the epidermis is torn, they are similar to the fragments of skin around the edges of one's finger nails known as hang nails.

The tribe Volvæ is divided artificially, according to the color of the spores.*

Genus I.—**Amanita.**

Spores white.
This is our largest genus of this tribe, of which 38 species are recorded in the U. S.

Genus 2.—**Volvaria.**

Spores pink.
A small genus, only twelve species being recorded in the U. S.

Genus 3.—**Locellinia.**†

Spores ochraceous or ferruginous
A small genus not recorded in the U. S.

Genus 4.—**Chitonia.**

Spores fuscous—purple.
Not recorded in the U. S.

There are no black spores species of the tribe Volvæ known.

AMANITA.

The genus Amanita is a large family, about seventy-five species being known. The characters are those of the tribe Volvæ with white spores. Amanitas are all terrestrial plants—and mostly solitary in their habits. They are generally medium sized or large, frequently bright colored, and are conspicuous in the woods.

There have been two important publications on the Amanitas of the U. S. First, by Prof. Morgan, (In the Journal of Mycology, Vol. 3, 1887,) a compilation of the known species (28) at that time. Second, by Prof. Peck, (33rd Report, 1880), description of 14 New York species.

Forty-two species of Amanita have by various authors been ascribed to this country.

Of these, five are common, viz:—cæsarea, phalloides, muscaria, rubescens and vaginata, and will be met probably by every student.

Nine or less frequent—but their occurance well authenticated, viz:—sperta, virosa, pantherina, Frostiana, excelsa, solitaria, strobiliformis, volvata and farinosa.

Nine European species reported need further confirmation, viz:—recutita, mappa, spissa, nitida, aspera, lenticularis, adnata, nivalis, strangulata.

Four are either varieties, or are too poorly described to be recognized, viz:—pellucidula, verna, soleata and onusta.

The remaining fifteen, many described from *dried specimens* have not been otherwise recorded than by the original author.

The genus is easily divided into two subgenera, viz:—

Ring present. Subgenus, **Amanita,** (typical.)

Ring none. Subgenus, **Amanitopsis.**

SUBGENUS AMANITA (Typical.)

The species are naturally divided into five sections by the character of the separation of the volva, at the base of the stipe. For illustrations and further remarks see under each section.

Section 1.—Limb of volva free.
Section 2.—Volva definitely circumscissile.
Section 3.—Volva irregularly circumscissile.
Section 4.—Volva friable.
Section 5.—Volva rudimentary.

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*To find the color of the spores, break off the pileus of the fresh agaric, and lay it gills down on a sheet of white paper. After a few hours, a deposit of spores will be found on the paper from which the color can be readily determined.

†In several English works this genus is called Acetabularia, and it is to be regreted that it had to be discarded, (on strict grounds of priority) as it was taken from the specific name of the only species of the genus known for many years.

SECTION 1.

Limb of the volva free, persistent as a cup surrounding the base of the stipe; splitting at the top, hence pileus usually naked, or only adorned with a few fragments of the volva, which accidentally adheres to it.

KEY.

Flesh yellow . . . . . 1 cæsarea.
Flesh white*
*Stipe equal or slightly thickened at base, volva appressed. (†)
*Stipe bulbous or volva globose. (‡)
†Margin striate, pileus pale brown, ... 2 sperta.
†Margin even, stipe silky, ... 3 recutita.
‡Pileus viscid, when young obtuse, spores globose, ... 4 phalloides.
‡Pileus viscid, when young, obtuse, spores elliptical . . . . . 5 magnivelaris.
‡Pileus viscid, when young acute . . . . 6 virosa.

1.—Amanita cæsarea, pileus, flesh, gills and stipe all yellow. Volva large, lax, white. Spores elliptical. Margin striate. (see Appendix p 13..)

This species is very large and easily recognized by the yellow color of the gills and flesh, no other species having gills a decided yellow color—though some have a cream tint; also by the persistent large volva at the base of the stipe. At first the plant is bright orange, fading with age to yellow. It is of very wide distribution in this country though nowhere common. In Europe it occurs in the Southern portions and Fries never saw a living specimen.

Fig. 3.—Amanita phalloides.

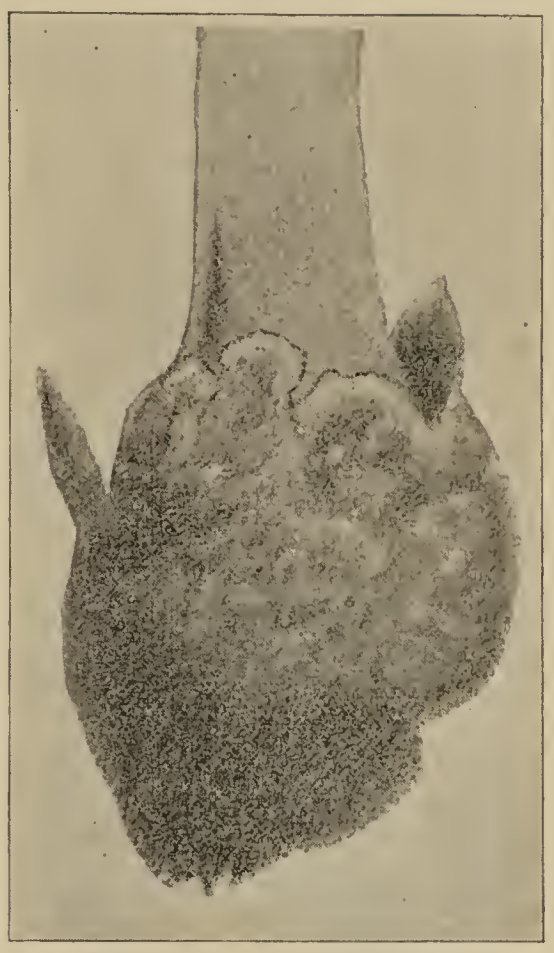

Fig. 2.—Base of stipe with free volva.

Amanita pellucidula. Under this name Miss Banning describes a new species (Peck's 44th Report) differing from cæsarea in having even margin and white stem, but it is probably only a form of cæsarea. (See Appendix, p. 13,)

2.—Amanita sperta. Stipe equal, Pileus smooth, substriate on the margin, pale brown (or whitish) spores elliptical. (See Appendix p. 13.)

This species was described by Prof. Peck in 1878. It is very closely allied to A. porphyria of Europe. It is distinguished from all the following of this section by its substriate margin. It grows in dry, sandy soil. Also reported Ala., U. and E.; Ohio, Morgan's Mss.; Penn, Herbst.

3.—Amanita recutita. Stipe slender, not bulbose at the base, volva not globose, stipe silky. Pileus dry, (not viscid when young). (See Appendix p. 13.)

This species has been recorded common N. C., Curtis—also Atkinson. We suspect that determinations were made from specimens of Peck's "sperta."

4.—Amanita phalloides. Pileus smooth, even, obtuse when young. Stipe slender. Volva globose, free, surrounding the base of the stipe. Spores globose. (See Stevenson, p. 4.)

This is one of the most common speeies in all sections. It is extremely variable in color. The prevailing color is white, though it occurs yellowish, brown or blackish brown. In Europe the illustrations are mostly white, bright green or bright yellow. We have collected pale greenish yellow specimens in Penn., though the bright green and yellow forms are not recorded in this country. We have twenty different records where this plant is mentioned from California to Vermont and from Canada to North Carolina. (See illustration on previous page.)

Amanita verna. This species, or rather form of phalloides, for it has no distinguishing marks, has been recorded from various plaees. It is simply a slender, pure white form of phalloides which occurs in early spring.

5. Amanita magnivelaris. Stipe slender with a bulbose base tapering and rooting. Ring large. Spores elliptical. (See Appendix p. 13.)

Described by Prof. Peck in 1897. The author does not state that the "appressed remains" form a cup at the base of the stipe, but we judge they do from his comparing the plant to verna.

6. Amanita virosa. Pileus smooth, even, at first conical and acute. Stipe slender, volva globose. Spores globose. (See Stevenson, p. 3.)

This species is pure white and is very close to phalloides differing only in the more aeute form of the pileus especially when young. The stem is also more scaly. It has been recorded, N. C., Curtis; Ind., Underwood; Cal., H. & M.; Ohio, Lea; Alabama, U. & E.; Iowa, McBride,; New England, Sprague.

Fig. 4. Volva separating circumscissile.

SECTION 2.

Volva separating circumcisally the lower part remaining as a definite crown to the bulbous base of the stipe or a definite ring surrounding the lower portion of the stipe.

Several species in the following section by rights belong here, but most of them instead of the volva forming an entire ring at the base of the stipe, breaks up into scales often disposed in rings. The difficulty of deciding from the often imperfect description of American species where to place the species has induced me to throw all the doubtful ones into the next section.

KEY.

Stipe globose at the base, the bulb crowned by the entire ring, ... 7 mappa.
Stipe enlarged (but not globose) at the base encircled by one or more rings, ... 8 pantherina.

7. Amanita mappa. Pileus dry, even, covered with scales, volva circumscissile, the stipe globose at base. (See Stevenson, p. 4.)

All of the species of the preeeding section have a free volva splitting at the top, hence the pileus is devoid of scales excepting a few fragments of the volva which accidentally may adhere to it, but in this species and those following the volva separates circumscissile, the upper portion being carried up and broken into scales on the pileus.

It is reeorded N. C., Curtis; New England, Frost; Minn., Johnson. We suspeet the species does not occur in this country and that the above records are all based on unusually warty specimens of phalloides Peck in his early days reports it, but *omits it entirely* in the more recent synopsis of the N. Y. series. The species could be readily recognized by the free entire crown to the globular bulbous base of the stipe, whereas in phalloides the free globular volva has the same general appearance, but it surrounds the base of the stipe.

8. Amanita pantherina. Pileus with a viscous pellicle, margin striate. Stem stuffed, then hollow, greaved at the base by the circumscissile volva. (See Stevenson, p. 6)

Recorded from N. C. "frequent" by Schweinitz (under the name umbrina), also Penn. It can not be common in N. Y., as Peck does not report it until '83. Wisconsin, Bundy; N. C., Curtis; Indiana, Underwood; Cal., H. & M.; Cincinnati, Lea, Morgan; Ala., Atkinson; Iowa, McBride: Minn., Johnson; Dr. Herbst, (Penn.) finds it every summer in the jungle baek of his house.

It appears to me that the species is eharacterized by a feature not found in many other species, and on which very little stress is placed in any of the books, viz.:—It is furnished at the base with two or more entire rings or collars "anello spurio" as Vittadini calls them.

These rings are very distinct and evident in every specimen preserved in my museum and in many of the European illustrations, notably Vittadini, (T. 39) (though poorly shown in Cook's figure.) They are formed by the circular laceration of the outer coat of the stipe near the base and have no relation to the scales often found at the bases of Amanitas which are remains of the volva.

European descriptions and plates usually represent this plant as brown, (olivaeeus-umber) but in this country it is very light color, usually white with a slightly darker disk.

SECTION 3.

Volva separating in an irregular circumscissile manner, usually breaking up into scales disposed in rings.

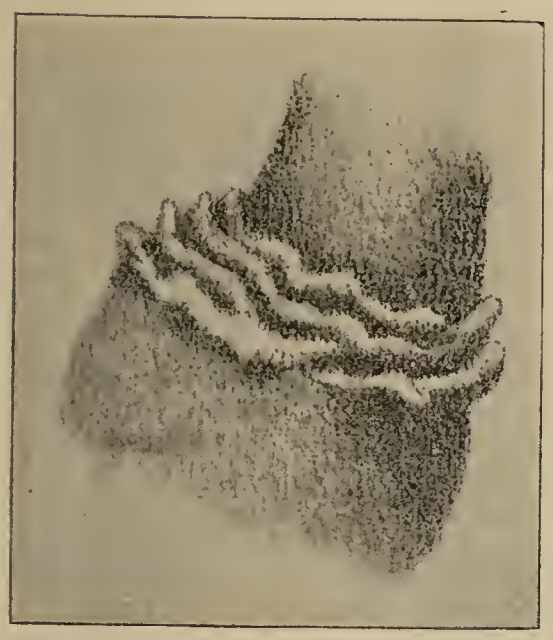

Fig. 5. Volva separating irregularly circumscissal.

Notwithstanding the confusion regarding whether many American species belong in this section or the preceding, the sections are clearly distinct and all the confusion is a result of imperfect observations and records; also of great disadvantage that many of our American species have been described from dried specimens, where the author is not familiar with the growing plant.

In the preceding section the volva separates definitely circumscissile, as though cut around with a knife, leaving an entire circular scar (or usually a ring) at the base of the stem; in this section it breaks irregularly circumscissile leaving at the base of the stem scales (more or less persistent) which are disposed in rings.

KEY.

Plant colored (white in a form of muscaria.)*
Plant white.†

***Spores elliptical.‡**

***Spores globose, ... 10 Frostiana.**

‡Margin of pileus striate, apex of stem striate from decurrent lines of the gills, ... 9 muscaria.

‡Margin of pileus striate. Gills rounded, not reaching the stem, ... 12 excelsa.

‡Margin of pileus sulcate, ... 11 russuloides.

†I conceive that the white species of this and the next section have been much confused, perhaps several of them are the same species re-described.

I cannot construct a key that would be of any value and only refer to the original descriptions in Appendix of this work. Most of these plants have solid stems, even margins, and usually large bulbous bases to the stipes. The white variety of *muscaria* can be readily distinguished from them by having neither of these characters.

Those who meet with a white species of Amanita should make a careful study and notes on it and compare it with the descriptions of the following species of this and the next section.

13. Candida.
14. Solitaria.
15. Polypyramis.
16. Strobiliformis.
17. Ravenelii.

NEXT SECTION.

Chlorinosma.
Daucipes, (said to be yellowish.)
Monticulosa.
Prairiicola.
Abrupta.
Nitida.

9. Amanita muscaria. Pileus in wet weather with a glutinous pellicle, margin striate, flesh yellowish under the pellicle. Spores elliptical. (See Stevenson, p. 5)

This species is common and reported on every list that has been published from Nebraska east. It is not recorded from the Pacific Coast. It is an extremely variable plant as to color. It is usually orange when young, fading to yellow, though variations occur, which are brown, livid, yellow, and even pure white. European plates of the plant are the most brilliant hues, generally bright flaming red. The gorgeous colors do not occur in this country, the usual color being a pale yellow, though I have seen very young specimens bright crimson, but they fade as the plants mature. Prof. Peck has mentioned the following varieties based on size or color, but the varieties are not constant, "var. regalis," "var. umbrinus," "var. alba," "var. formosa."

10. Amanita Frostiana. Color orange or yellow resembling *muscaria*, margin striate, spores globose. (See Appendix, p. 13.)

This species was originally listed (though never published) by Frost, under the name Amanita affinis. In Peck's early work he called it Amanita muscaria var. minor, describing it as a distinct species and changing Frost's name in his revision of the genus. It resembles a small form of *muscaria* in every respect save it has globose spores. It has been reported N. Y., Peck; Mass., Frost; Wis., Bundy; Ala., U. & E.; Penn., Herbst.

11. Amanita russuloides. Color pale yellow. Margin of pileus widely striate-tuberculate. Spores elliptical. (See Appendix, p. 14.)

This is an extremely rare plant. It was discovered by Prof. Peck and described in 1871, but has not been met with by him or recorded by others since. Dr. Herbst a few seasons ago found a plant which he doubtfully referred here. Should it be again found it should be readily recognized by the widely striate tuberculate margin of the pileus, similar to Russula fragilis, (whence its name.)

12. Amanita excelsa. Pileus fuscous grey, stem stuffed becoming hollow, margin striate. Gills free, (not decurrent as a line down the stem.) (See Stevenson, p. 6.)

Reported N. C., Schweinitz and Curtis; Cal.. H. & M.; Mass., Frost and Andrews; Minn., Johnson.

13. Amanita candida. Pileus even on margin. Stem solid bulbous. Annulus attached to the top of the stem. Spores elliptical. (See Appendix, p. 14.)

Described by Prof. Peck, 1897, from dried specimens collected by Underwood in Ala.

14. Amanita solitaria. Pileus even on margin. Stem solid, bulbous, narrowed into a long root-like projection below the ground. (See Appendix, p. 14.)

Appears rare in New York, as Peek does not report it until 1880. Maryland, Banning; Cincinnati, Morgan, Lloyd; Alabama, Atkinson and U. & E.; North Carolina, Atkinson; Penn., Herbst. I am inclined to think that more than one species are confused under the name. It is usual to consider the bulbous root, the bulb below the ground, as distinguishing this species, but I have a photograph of a specimen from Trexlertown, supposed to be this species devoid of all bulbous swelling to the root.

15. Amanita polypyramis. Prof. Morgan considers this a synonym for solitaria and I can see no points in its description that do not apply to this species. (See Appendix, p. 14.)

Described by Berkeley (1853) from dried specimens submitted by Curtis from North Carolina.

16: Amanita strobiliformis. (See Stevenson, p. 7.)

Rare in New York but usually attains a large size. Peck; Md., Banning; N. C,. Curtis; Cal,. H. & M.; Mass., Frost; Ala.. U. & E.; Penn., Herbst.

I doubt very much if the plant usually ascribed to this species in this country belongs to it. The specimen that I have seen at Trexlertown, Pa., and specimens in my museum from Dr. Herbst characterized by a bulb above the ground, as emphasized by Prof. Peek in his description of the plant, do not accord with Vittadini's excellent plate either in the shape of the bulb, the shape of the warts, or the nature of the separation of the volva. The plate would indicate that separation is definitely circumscissile as in pantherina, throwing the plant into the preceding section, while the plant I have seen evidently belongs to this section the separation being similar to solitaria.

Besides all European authors describe the plant as having a subterranean bulb while in our plant the bulb is almost entirely above the ground.

17. Amanita Ravenelii. A species very closely related to the preceding. (See Appendix, p. 54.)

Described by Berkeley 1859, from dried specimen collected in Carolina by Ravenel. Atkinson since has collected specimens in Alabama which he referred to this species.

SECTION 4.

Volva wholly friable, breaking up into scales at the base of the stipe.

Fig 6. Volva friable

This section is somewhat similar to the preceding, differing in the less permanent nature of the scales at the base of the stem. In some species they adhere so loosely that they hardly leave scars where they fall off.

KEY.

Color white or with yellowish scales.*
Color umber or olivaceous.†
Color reddish yellow or dingy red.‡

*Stem bulbous, Gills touching stem, Pileus yellowish, 18 daucipes.
*Stem bulbous, Gills touching, Pileus white, 19 abrupta.
*Stem bulbous, Gills remote, ... 20 monticulosa.
*Stem not bulbose, Pileus 10 to 15 cm. broad, 21 chlorinosma.
*Stem not bulbous, Pileus 4 to 7 cm. broad, 22 prairiicola.
†Flesh clear white, warts small, adnate, 23 spissa.
†Flesh clear white, warts thick, large, . 24 nitida.
†Flesh fuscous under the cuticle, ... 25 aspera.
‡Flesh quickly turning reddish when bruised, 26 rubescens.
‡Flesh yellowish unchangeable, . . . 27 flavo-rubens.

18. Amanita daucipes. Plant saffron colored. Stipe solid with bulbous root. Warts pyramidal. (See Appendix, p. 14.)

This species is founded by Montagne on a colored drawing sent to Paris by Sullivant* from Columbus, Ohio., along in the fifties.

19. Amanita abrupta. Plant white. Stipe solid with bulbous base. Warts pyramidal. (See Appendix, p. 14.)

Described by Peck from dried specimens collected in Ala. by Underwood and Earle.

20. Amanita monticulosa. Pileus with discolored warts. (See Appendix, p. 14.)

Gills remote from stem, the only character where the distinction from the preceding two is obvions. Indeed, considering that all the descriptions have been drawn up from dried specimens it would not be surprising if all turned out to be the same thing.

Described by Berkeley from specimens sent from S. C. by Curtis who in his Catalogue says "common in sandy woods."

21. Amanita chlorinosma. A large white species with the margin of the pileus covered with a dense white coat of powdery substance; also characterized by a strong chlorine-like odor. (See Appendix, p 15)

Originally sent Peck from New Jersey by Austin. Reported from same state by Gerard and also from Ala. by U. & E.

22. Amanita prairiicola. Stem not bulbous at the base. Pileus only slightly warty. (See Appendix, p. 15.)

Described by Peck from dried specimens sent by E. Bartholomew which grew on the open prairie, Kansas. Not reported elsewhere.

23. Amanita spissa. Flesh white unchangeable. Pileus with a few not sharp warts. (See Stephenson, p. 8.)

The occurrence in this country is very doubtful. Reported from Maryland by Miss Banning and from Nova Scotia, Somers.

24. Amanita nitida. Flesh white unchangeable. Readily recognized by the thick angular warts. (See Stevenson, p. 9.)

This must be very rare in this country. Peck does not report it till 1889, and omits it entirely in his N. Y. monograph 1880. Reported from California, Harkness, (very poor authority.) Miss Banning says however "common in nearly every woods in Maryland," but I think she is mistaken.

25. Amanita aspera. Flesh not pure white. Pileus thickly covered with sharp warts. The illustrations of the plant remind one very much of Lepiota acutesquamosa. (See Stevenson, p. 9.)

Rarely reported from this country. N. C., (rare late in Autumn,) Schweinitz; Wisc., Bundy; Minn., Johnson.

26. Amanita rubescens. This species is readily distinguished from all other Amanitas known in this country by the flesh turning reddish when bruised. (See Stevenson, p. 8.)

This is one of the most common species in this country though it is not reported west of the Mississippi. At Mammoth Cave, Ky., I have seen the woods fairly covered with it. Around Cincinnati it is the most frequent species we meet, though all Amanitas are rare here. The warts densely cover the young plant but they easily separate and fall off, especially in wet weather, and after rains I have frequently seen mature specimens perfectly smooth. The plant can always be known by the red spots where it is bruised or worm eaten. The color of the bruised flesh is dull red, (inclined to brown) not bright as erroneously shown in Krombholz's figure.

27. Amanita flavo-rubens. Pileus reddish-yellow. Stipe hollow. (See Appendix, p. 15)

Species was founded on Sullivant's figure and specimens sent Montagne from Columbus. (See note* below.) Nuttall refers a plant here from W. Va.

Notwithstanding the author compares this plant only with rubescens I have a strong suspicion it is only a yellow form of muscaria. At Cincinnati, one hundred miles south of Columbus, yellow muscarias are all we find, and in addition European authors are accustomed to associate muscaria with the bright red form which occurs there.

SECTION 5.

Volva rudimentary, flocculose, wholly disappearing. But one species of this section has ever been ascribed to this country, viz:

28. Amanita lenticularis. Pileus naked, margin even. (See Stevenson, p. 10.)

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*Over forty years ago Sullivant collected over 400 specimens of fungi around Columbus, Ohio, which he dried and also had water color drawings of them made by Robinson. These were sent to Montagne at Paris, France, who founded on them about sixty "new species" which he published in his "Sylloge." During the winter of 1897-98 I made a visit to Paris almost with the sole object of studying these specimens and securing photographs of these pictures, but was very much disappointed to learn from my friend N. Patouillard, that the entire set has been lost and is not preserved in any Museum in Paris. It is certainly to be hoped that the set will yet be found.

The illustrations of this speeies show neither warts nor traces of a volva and we should think a beginner would naturally think it was a Lepiota should he meet a speeimen.

The oeeurrence of this speeies in the U. S. is exceedingly doubtful. Curtis lists it from N. C. but he questions his own determination and Bnndy (extremely poor authority) reports it from Wisconsin.

SUBGENUS AMANITOPSIS.

Ring none. Saccardo has separated the species devoid of a ring from the genus Amanita under the name Amanitopsis but inasmuch as it only complicates the system of classification we have preferred to retain them under one genus.*

Fig. 7. Amanita vaginata, (from photograph.)

Section 6.

Volva persistent, present when the plant is mature, though in some species so deeply in the ground that it is apt to be overlooked.

KEY.

Pileus deeply sulcate.*
Pileus striate (not sulcate)†
Pileus with even margin.‡
***Spore globose. Pileus with few warts, . . 29 vaginata.**
***Spores globose. Pileus warty. Gills somewhat adnate, ... 30 velosa.**
***Spores elliptical, 31 agglutinata.**
†Margin striate, volva large, 32 volvata.
‡Margin even. Gills adnate, 33 adnata.
‡Margin even. Gills free, 34 pusilla.

29. Amanita vaginata. Pileus naked or with a few warts; deeply sulcate. Volva lax. Gills free. (See Stevenson, p. 11.)

There is no more eommon species in this country nor one that is more variable. The beginner is sure to make several speeies of it. It is reeorded from every seetion, Cal. to the Atlantic. It varies in size from a eouple of inehes to ten inehes, and in eolor from light umber to tawny orange. We have near Cincinnati two colors which no one at first would suppose could be the same speeies: first deep umber in the immediate vicinity of the eity where I have never found the next; seeond, a bright orange tawny color about 20 miles south in Kentucky where it seems to be the only form to oeeur. The volva of this speeies is deep in the ground and will only be noticed by digging up the plant.

*Besides according to Stevenson the ring is present in vaginata. He makes the rather paradoxical statement, "the ring though obsolete is present, more or less eonspieuously at the base of the stem, disclosed in the volva." We have never seen any traee of a ring.

30. Amanita velosa. (See Appendix, p. 15.)
A western plant very closely related to vaginata (too close we are afraid, taking into account the variability of this species) described by Prof. Peck, from dried specimens sent by McClatchie. It differs in the more numerous and thicker warts and in somewhat adnate gills.

31. Amanita agglutinata. Spores elliptical. Pileus white. Stipe solid. (See Appendix, p. 15.)
Described from dried specimens sent Berkeley by Curtis from S. C. Not reported otherwise. Very close to vaginata but said to differ in solid stipe, more viscid pileus and elliptical spores.

32. Amanita volvata. Pileus striate (not sulcate). Spores elliptical, volva large, persistent, firm. (See Appendix, p. 15.)
A well marked species described by Peck in 1871 and widely distributed. N. Y., Peck; Maryland, Banning; Mass., Frost; Cin., Morgan, Lloyd (it grows here only in one rather marshy woods at College Hill.) Ala., U. & E.; N. C., Atkinson; Penn., Herbst. Nothing demonstrates how little attention was paid to the Agarics by Schweinitz after he went to Penn. than the fact that he entirely overlooked this characteristic species. That it is common on his collecting ground we know from personal collections.
Amanita soleata. (See Appendix, p. 15.) No doubt the same as volvata, poorly, (and subsequently,) described by Howe.

33. Amanita adnata. Margin even. Gills adnate. (See Stevenson, p. 12.)
A plant said to be rigid like a Russula. Reported from this country by four observers, but none of them trustworthy and its occurrence is doubtful. Cal., Harkness; Wis., Bundy; Nova Scotia, Sommers; Minn., Johnson.
The volva said to break into scales, though the excellent figure of Saunders, Smith and Bennett shows a distinct cup-shape volva.
Amanita onusta. (See Appendix, p. 16.) The folly of a beginner in Mycology describing new species when he has not even a passing acquaintance with the old, cannot be too severely condemned. It only encumbers the science with a lot of useless synonyms

34. Amanita pusilla. Pileus even. Gills free. Stipe bulbous.
Described by Prof Peck, 1897, A little plant pileus about one inch broad. (See Appendix, p. 16.)

Section 7.

Volva rudimentary, floccose, or soon breaking into scales.

KEY.

Large plants, 8 cm. or more.*
Small plants, 5 cm. or less.†
***Pileus white or slightly tinged with yellow, warts few, 35 nivalis.**
***Pileus warty, grayish brown, ... 36 strangulata.**
†Pileus mealy, grayish brown, ... 37 farinosa.
†Pileus pubescent, yellow, ... 38 pubescens.

35. Amanita nivalis. Pileus naked or with a few warts Spores globose. (See Appendix, p. 16.)
This species is considered by Fries a form of vaginata but Prof. Peck finds a plant which he considers distinct, chiefly because the volva breaks up into scales. As Greville's figure shows a prominent entire volva (and Greville is remarkably accurate in his excellent figures) and besides, he describes it as *persistent*, we opine that Prof. Peck's plant belongs somewhere else, perhaps a new species. Also reported Ala., Atkinson; West Va., Nuttall.

36. Amanita strangulata. Pileus grayish-brown, thickly covered with warts. (See Stevenson, p. 11.)
Berkeley (Outlines, p. 92,) describes a plant under the name Ceciliæ stating that it differs from vaginata in having a stuffed stem instead of a few cottony fibers. Fries united Berkeley's plant to his strangulata which he chiefly distinguishes from vaginata in having the pileus closely covered with broad close scales. Smith states the English plant has oval spores. Peck that the American plant has globose spores and the English plate of Saunders, Smith and Bennett shows globose spores. Very rare. Prof. Peck has found it but once, (twenty years ago on Long Island,) Frost reports it from Massachusetts and Bundy and Johnson thought they found it in Wisconsin and Minnesota.

37. Amanita farinosa. Pileus deeply striate; mealy with a white powder very dense near the center of the pileus. (See Appendix, p. 16.)
A very small species described by Schweinitz from N. C. Reported also N. Y., Peck; Cincinnati, Morgan Mss; New Jersey, Ellis; Penn., Herbst.

38. Amanita pubescens. Pileus pubescent, yellow. (See Appendix, p. 16.)
Another small species never reported since originally described by Schweinitz from N. C. seventy-five years ago. If met with it should be readily recognized by its small size and pubescent pileus.

VOLVARIA.

The genus Volvaria is rosy-spored corresponding to Amanita, excepting the spores are not white. None of the species have rings. The volva is firmer and not friable as in many Amanitas, hence it usually remains as a cup around the base of the stipe and does not break up and seldom forms warts as in most of the Amanitas.

A few Volvarias grow on rotten wood, but most of the species are found in rich mould or manured ground. One grows on decaying fungus.

KEY.

Plant growing on rotten wood.*
Plant growing on decaying fungus.†
Plant growing on the ground.‡
*Pileus dry, ... 1 bombycina.
*Pileus viscid . . . . . 2 Peckii.
†Plant growing on decayed fungus, ... 3 Loveiana.
‡Plant very small, less than an inch.¶
‡Plant medium, 2 inches or more.§
¶Pileus even, silky, ... 4 parvula.
¶Pileus striate, ... 5 striatula.
¶Stipe with spreading hairs, ... 6 pubescentipes.
§Pileus dry.‖
§Pileus viscid.£
‖Pileus even, ... 7 volvacea.
‖Pileus striate.₱
₱Volva cup shape, ... 8 Taylorii.
₱Volva merely a rim, ... 9 emandatior.*
£Pileus fulvous=ochraceous, ... 10 viscosa.
£Pileus grey or umber at disk, ... 11 speciosa.
£Pileus fulginous, ... 12 gloicephala.
£Pileuis white . . . . . 9 emandatior.*

Fig. 8. A young plant Volvaria bombycina. (From photograph.)

1. Volvaria bombycina. Pileus campanulate then expanded, dry silky fibrillose. (See Stevenson, p. 183.)

A large plant growing on rotten wood recorded from all sections of the country. Though of wide distribution it is nowhere abundant. It usually grows on maple frequently being found on the decay around a sugar tap. Farlow records it on oak and we have seen it on beech. Millspaugh in reporting it gives its habitat "on dead insect" which is evidence enough that he is in error. The volva is quite thick and we frequently find the plant in the egg state looking like a young phalloid.

2. Volvaria Peckii. Pileus thin, convex, viscid. (See Appendix. p. 16.)

Described from a single specimen collected in N. Y. by Atkinson and never recorded elsewhere.

3. Volvaria Loveiana. Pileus white, silky, margin involute. (See Stevenson, p. 184.)

Though there is no printed record of this plant in the United States, we have been favored with specimens from Prof. John Dearness, London, Canada, which grew on a decaying Clitocybe monadelphus. It is rare in Europe and Prof. Dearness' find is of great interest. The peculiar habitat of the plant (decaying agarics) would enable it to be recognized at once.

(*) The author does not state whether the pileus is viscid or dry, a fatal omission in describing a Volvaria. He no doubt did not know however, as he described it from a dry specimen.

4. Volvaria parvula. Plant small. Pileus even, silky. (See Stevenson, p. 186.)

This plant is recorded from N. C., Schweinitz and Curtis; Md., Banning; Mass., Frost; Wisc., Bundy; New England, Sprague; but how many records are based on the following plant it is difficult to say.

5. Volvaria striatula. Pileus thin, silky, striate on the margin. Plant small. (See Appendix, p. 16.)

Described by Prof. Peck from dried specimens sent from Kansas by Bartholomew. The *small* species of volvaria deserve further study. I have before me a fresh specimen found in a hot house of parvula agreeing with the description and Cooke's, Krombholz' and Patouillard's figures, but it is *not* umbonate (nor do the three figures so show it) and the margin is even, (as the figures show) though it dries striate. I have alcoholic specimens of what I took at the time of collection to be the same species which shows faintly striate. I have another species (dried, and in alcohol) agreeing with the description in being *umbonate* (and Fries underscores umbonate) and it is also *striate*. Cordier's figure of "parvula" is *strongly striate*. Additional specimens and notes on the small species of Volvaria are are earnestly desired.

6. Volvaria pubescentipes. A small plant about an inch high, distinguished by the spreading hairs on the stipe. (See Appendix, p. 17.)

Described by Peck in 1875. No records since save Morgan's Mss. from Cincinnati. Saccardo spells the name pubipes but whether intentional or a misprint is doubtful.

Fig. 9. Volvaria volvacea. (From photograph.)

7. Volvaria volvacea. Pileus campanulate then expanded. Fibrils appressed, dark. Volva lax. (See Stevenson, p. 183.)

This is a much smaller plant than bombycina and grows in the ground. It is usually found in hot houses, cellars, etc., though we once collected a specimen at the roots of a tree in the woods. It occurs every year in the cellar of our drug store. Reported also N. C., Schweinitz; Minn., Johnson; Preston, O., Morgan Mss.

8. Volvaria Taylorii. Pileus conical-campanulate, deeply striate. (See Stevenson, p. 184.)

Only reported from this country on very doubtful authority. Minn., Johnson.

9. Volvaria emendatior. Pileus umbonate, smooth, white. Volva forming merely a rim around the stem. (See Appendix, p. 17.)

Described by Berkeley from dried specimens from New England, Sprague, and N. C., Curtis. The author does not state whether the pileus is viscid or dry which leaves us in doubt in which section to place it, though it is probably viscid as most smooth species are. There is no other record of the plant.

10. Volvaria viscosa. Pileus campanulate-convex, very viscous, ochraceous. Stipe bulbous. (See Appendix, p. 17.)

The habitat is not stated though presumably in the ground. Described from Nebraska by Clements, no other record.

11. Volvaria speciosa. Pileus grey, umber at the disk, viscous. Stipe villous at the base. (See Stevenson, p. 185.)

"Common in cultivated soil, especially grain fields and along roads A fine edible Agaric and our most abundant one in California"—McClatchie. Not reported elsewhere save Wise., Bundy, and that doubtful.

12. Volvaria gloiocephala. Volva fuliginous, glutinous, striate on the margin. Stipe smooth. (See Stevenson, p. 185.)

Cal., H. & M.; Cincinnati, Morgan Mss.; Minn., Johnson.

APPENDIX.

Descriptions* of American Volvae and references to European species reported from this country.

AMANITA, (Typical.)

Section 1.

Amanita cæsarea. Pileus hemispherical, then expanded, smooth, bright red or orange, fading to yellow, widely and *distinctly striate on its margin;* lamellæ free, *yellow;* stem equal or slightly tapering upward, flocculose, stuffed with cottony fibrils or hollow, yellowish, bearing a yellowish annulus near the top and inserted at the base in a *large loose membranous white volva;* spores elliptical, 8-10 mc. long. Plant 12-20 cm. high, pileus 10-20 cm. broad, stem 8-12 mm. thick. (Peck, 33rd Rep.)

Amanita pellucidula. Pileus at first campanulate, then expanded, slightly viscid, fleshy in the center, attenuated at the margin, smooth, bright red, deeper at the top, shaded into clear transparent yellow at margin, glossy, flesh white, unchanging; lamellæ ventricose, free, numerous, yellow; ring descending, fugacious; stem stuffed. (Banning, Peck's 44th report.)

Amanita spreta. Pileus subovate, then convex or expanded, smooth or adorned with a few fragments of the volva, substriate on the margin, whitish or pale-brown; lamellæ close, reaching the stem, white; stem equal, smooth, annulate, stuffed or hollow, whitish, finely striate at the top from the decurrent lines of the lamellæ, not bulbous at the base, but the volva rather large, loose, subochreate; spores elliptical, generally with a single large nucleus, 10-12 mc. long, 6-8 mc. broad. Plant 10-11 cm. high, pileus 7-12 cm. broad, stem 8-12 mm. thick. Ground in open places. (Peck 32nd Report.)

Amanita recutita. Pileus convex then explanate, *dry* glabrous, often squamulose with fragments of the volva; margin almost even; stipe stuffed then hollow, attenuate, *silky*, vaginate with the narrow appressed margin of the obliterated circumscissile volva. (Fries Epic., p. 19.)

Amanita phalloides. (Stevenson, p. 4. Fries Epic., p. 18.)

Amanita magnivelaris. Pileus convex or nearly plane, glabrous, slightly viscid when moist; even on the margin, white or yellowish-white, lamellæ close, free, white; stem long, nearly equal, glabrous, white, furnished with a large membranous volva, the bulbous base tapering downward and radicating; spores broadly elliptical, 10 mc. long, 6-8 mc. broad. Pileus 7-12 cm. broad, stem 12-18 cm. long, 8-12 mm. thick. Solitary in woods. (Peck, 50th Report.)

Amanita virosa. (Stevenson p. 3. Fries Epic., p. 18)

Section 2.

Amanita mappa. (Stevenson p. 4. Fries Epic., p. 19.)

Amanita pantherina. (Stevenson, p. 6. Fries Epic., p. 21.)

Section 3.

Amanita Frostiana. Pileus convex or expanded, bright-orange or yellow, warty, sometimes nearly or quite smooth, striate on the margin; lamellæ free, white or slightly tinged with yellow; stem white or yellow, stuffed, bearing a slight, sometimes evanescent annulus, bulbous at the base, the bulb *slightly margined* by the volva; spores *globose*, 7-10 mc. in diameter. Plant 5-8 cm. high, pileus 2½-5 cm. broad, stem about 4 mm. thick. (Peck, 33rd Report.)

Amanita muscaria. (Stevenson, p. 5. Fries Epic., p. 20.)

Amanita excelsa. (Stevenson p. 6. Fries Epic., p. 21.)

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*While no quotation marks are used it must be understood that these are taken from original descriptions. European species described in Stevenson are not reproduced here, though when the species is not English, descriptions are drawn either from Fries' Epicrisis or Peck's summary of New York species.

Amanita russuloides. Pileus at first ovate, then expanded or convex, rough with a few superficial warts, or entirely smooth, viscid when moist, widely striate-tuberculate on the margin, pale yellow or straw color; lamellæ close, free, narrowed toward the stem, white; stem firm, smooth, stuffed, annulate, equal or slightly tapering upward, bulbous; annulus thin, soon vanishing; volva fragile, subappressed; spores broadly elliptical, 10 mc. long, 7½ mc. broad. Plant 5-8 cm. high, pileus 4-5 cm. broad, stem 6-10 mm. thick. Grassy ground in open woods. (Peck, 25th Report.)

Amanita candida. Pileus thin, broadly convex or nearly plane, verrucose with numerous small erect angular or pyramidal easily separable warts, often becoming smooth with age, white, even on the margin; flesh white; lamellæ rather narrow, close, reaching the stem, white; stem solid, bulbous, floccose-squamose, white, the annulus attached to the top of the stem, becoming pendent and often disappearing with age, floccose-squamose on the lower surface, striate on the upper, the bulb rather large, ovate, squamose—not margined, tapering above into the stem and rounded, or merely abruptly pointed below; spores elliptical, 10-13 mc. long, 7 mc. broad. Pileus 7-15 cm. broad. stem 6-12 cm. long, 10-16 mm. thick, the bulb 2½ to 4 cm. thick in the dried specimens. (Peck, Bull Torr. Club. Vol. 24, p. 137-138.)

Amanita solitaria. Pileus convex or plane, *warty*, white or whitish, *even* on the margin; lamellæ reaching the stem, white or slightly tinged with cream color; stem at first mealy or scaly, equal, *solid*, white, bulbous, the bulb scaly or mealy, *narrowed below into a root-like prolongation, annulus lacerated*, often adhering in fragments to the margin of the pileus and lamellæ; spores elliptical-oblong, 7 12 mc. long, 6 mc. broad. Plant, 10-20 cm. high, pileus 8-15 cm. broad, stem 8-12 mm. thick. (Peck, 33rd Report.)

Amanita polypyramis. Pileus 15 cm. across, pure white, shining areolate, beset with thick. rather small, pointed pyramidal warts, especially in the center. Stem, 15-20 cm. high, 2-5 cm. thick, solid, incrassated and rooting below, almost smooth with the exception of a few little narrow transparent scales; ring broad, evanescent. Gills white, reaching the stem, quite linear at the extremity. Odor strongly alkaline. (Berk., Ann and Mag. Nat. Hist. Vol. 12, 2nd series, p. 417.)

Amanita strobilformis. (Stevenson, p. 7. Fries Epic., p. 21.)

Amanita Ravenelii. Pileus 10 cm. across; convex broken up into distinct areae, each of which is raised into an acute rigid pyramidal wart; stem 8 cm. high, 2½ cm. or more in thickness at the base, furnished with a thick warty volva, and a deflexed ring. (Berk., Ann and Mag. Nat. Hist. Vol. 4, 3rd series, p. 284.)

Section 4.

Amanita daucipes. Volva fugacious. Pileus hemispherical-globose, compact, uniformly warted. Warts pyramidical, saffron color. Flesh soft white. Stipe solid with a bulbous root, with a constricted cortina above and squamulose downward. Gills narrow, touching (the stipe) attenuate both ways. Stipe 12-15 cm. long, pileus 6 cm. broad, veil fibrillose extending from the margin of the pileus to the apex of the stipe, fugacious. In cultivated fields. (Montagne Sylloge p. 96.)

Amanita abrupta. Pileus thin, broadly convex or nearly plane, verrucose with small angular or pyramidal erect somewhat evenescent warts, slightly striate on the margin, flesh white; lamellae moderately close, reaching the stem and sometimes terminating in slightly decurrent lines upon it, white; stem slender, glabrous, solid, bulbous, white, the bulb abrupt, subglobose, often coated below by the white persistent mycelium, the annulus membranous, persistent; spores broadly elliptical or subglobose, 7-10 mc. long, 6-7 mc. broad. Pileus 5-10 cm. broad; stem 6-10 cm. long, 6-8 mm. thick. (Peck, Bull. Torr. Club. Vol. 24, p. 138.)

Amanita monticulosa. Pileus 6-8 cm. across, convex, areolate, with a wart in the center of each areola; those toward the margin consisting of soft threads meeting in a point, but sometimes simply flocculent, the central warts angular, pyramidal, truncate, discolored. Stem bulbous, scaly, flocculent, white;

veil thick at length distance. Gills free, ventricose, remote, forming a well defined area around the top of the stem. The warts are not hard and rigid as in A. nitida, and the free remote gills separate it from that and the neighboring species. (Berk., Ann and Mag. Nat. Hist. Vol. 12, 2nd Ser. p. 418.)

Amanita chlorinosma. Pileus convex or expanded, warty on the disk, covered on the even margin with a light powdery at length evanescent substance, white; lamellae white; stem nearly cylindrical, stout, deeply penetrating the earth; spores broadly elliptical, 7-10 mc. long, odor distinct, chlorine-like. Plant 15-18 cm. inches high, pileus 10-15 cm. broad, stem 3-5 cm. thick. (Peck, Bot. Gaz., Vol. 4, p. 137.)

Amanita prairiicola. Pileus thin, convex, slightly verrucose, white, more or less tinged with yellow, even on the margin, flesh white; lamellae rather broad, subdistant, reaching the stem, white; stem equal or slightly tapering upward, somewhat squamose toward the base, white or whitish, the annulus persistent; spores large, broadly elliptical, 12-14 mc. long, 7-9 mc. broad. Pileus 4-7 cm. broad, stem 5-6 cm. long, 4-8 mm. thick. Bare ground on open prairies. (Peck, Bull. Torr. Club. Vol. 24, p. 138.)

Amanita spissa. (Stevenson p. 8. Fries Epic., p. 23.)

Amanita rubescens. (Stevenson p. 8. Fries Epic., p. 23.)

Amanita flavo-rubens. Pileus convex, then expanded, reddish-yellow, strewn with thick unequal mealy warts. Stipe stuffed or hollow, tall, squamulose, naked bulb at the base, mealy above. Ring above, reflexed, lacerate. Gills, close, white, attenuated and touching (the stipe). Pileus 9 cm. broad, obscurely umbonate, variegated with red and yellow. Warts yellowish, thinly spread. Margin striate. Stipe 15 cm. long, bulbose at base, a cm. thick in the middle. Spores white, globose, 10 mc. in diameter. (Montagne Sylloge p. 96.)

Section 5.

Amanita lenticularis. (Stevenson p. 10. Fries Epic., p. 26.)

Section 6.

Amanita vaginata. (Stevenson p. 11. Fries Epic., p. 27.)

Amanita velosa. Pileus at first subglobose, then campanulate or nearly plane, generally bearing patches of the remains of the whitish felty or tomentose volva, elsewhere glabrous, becoming sulcate-striate on the margin, buff or orange-buff, flesh compact, white; lamellae close, reaching the stem, subventricose, pale cream color; stem firm, at first tomentose and attenuated at the top, then nearly equal, stuffed, white or whitish, closely sheathed at the base by the thick volva; spores globose, 10-12 mc. broad. Pileus 5-10 cm. broad; stem 7-10 cm. long, 6-8 mm. thick. (Peck, Bull., Torr. Club. Vol. 22 p. 485.)

Amanita agglutinata. White, pileus 2-5 cm broad, scaly from the remains of the volva, margin thin Stem 1-4 cm. high, 4 mm. thick, enlarged at the apex bulbous at the base, furnished with a volva whose margin is free. Ring wanting. Gills broad, ventricose, round and free behind. Spores white, elliptical. (Berk, Ann, Jour., Arts and Sci., 2nd Ser., Vol. 8, p. 401)

Amanita volvata. Pileus fleshy, convex, at length expanded, striate on the margin sprinkled with small floccose scales, whitish, the disk pale brown; lamellae close, free, white; stem equal or slightly tapering upward, stuffed, minutely floccose, scaly, ringless, whitish; volva large, firm, loose; spores subelliptical 6 mc. long, plant, 5-7 cm. high, pileus as broad, stem, 6-8 mm. thick. (Peck, Report 24, p 60.)

Amanita soleata. Pileus 5-7 cm. broad, fulvous brown, somewhat uneven, with patches of tomentum, sprinkled with a fine, dingy yellow powder; margin thin, striate; stem 5 cm. high, 6-8 mm. thick, ringless, smooth, attenuated downwards, fistulose; volva 2-3 cm. broad, even, entire or with a shallow sinus; gills whitish, changing to a cinerous brown in drying. (Howe Bull. Torr. Bot. Club. Vol. 5, p. 42.)

Amanita adnata. (Stevenson p. 12. Fries Epic. p. 28.)

Amanita onusta. Pileus 12-15 cm. broad, brownish gray, clothed with dust colored warts which easily rub off, (persistent about the dark center) leaving spots of a deeper brown ; margin thick, not at all striate; stem 7 cm. high, 2½ cm. thick, attenuated upwards, enlarging as it enters the cap, farinose, ringless, white, stuffed, concentrically squamulose below, the large bulb firmly rooting. Flesh and gills white, the latter changing to fulvous hue in drying. Slightly acrid. Stem very glutinous, at length hard and fibrous. (Howe, Bull. Torr. Bot. Club. Vol. 5, p. 42.)

Amanita pusilla. Pileus thin, broadly convex or nearly plane, subglabrous, slightly umbonate, even on the margin, pale brown ; lamellae narrow, thin, close, free, becoming brownish ; stem short, hollow, bulbous, the bulb margined by the remains of the membranous volva, spores broadly elliptical, 5-6 mc. long, 4 mc. broad. Pileus about 2½ cm. broad; stem 1½-2½ cm. long, 2-4 mm. thick. (Peck, 50th Report.)

Section 7.

Amanita nivalis. Pileus at first ovate, then convex or plane, smooth, *striate on the thin margin, white*, sometimes tinged with yellow or ochraceous on the disk, flesh white; lamellae subdistant, white, free; stem equal, rather tall, nearly smooth, *bulbous*, stuffed, white, the volva very fragile, *soon breaking up into fragments or sometimes persisting in the form of a collar-like ring at the upper part of the bulb*; spores globose, 7-10 mc. in diameter. Plant 10-15 cm. high, pileus 5-7 cm. broad, stem 4-8 mm. thick. (Peck, 33rd Report, p. 48)

The above is Prof Peck's description of the American plant. As stated in part 1, we do not think it applies to Greville's plant.

Amanita strangulata. (Stevenson p. 11. Fries Epic., p. 27.)

Amanita farinosa. Pileus mealy, with plicate margin. Gills entire, white, unchangeable. Stipe bulbose, solid (*) livid. Related to vaginata but smaller and not furnished with a volva. (†) Pileus with the margin elegantly plicate, mealy, principally in the center, where the powder is a copious heap and can be wiped off. An inch broad. Stipe mealy. Ring wanting. Plant two inches high. (Schw., Syn. Fung. Car, Sup. No. 553.)

(*) Peck states "stuffed or hollow."

(†) It is evident that Schweinitz description "nec volva instrueta" must not be taken *literally* else it would not be an Amanita. Peck deseribes the volva as evanescent.

Amanita pubescens. Pileus pubescent, yellow, margin involute. Gills white. Stipe short, bulbous, pubescent, white, becoming yellowish. Pileus covered with a thin pubescence. Stipe short, scarcely exceeding an inch. Bulb fleshy. Volva vanishing. Ring none. (Schw., Syn. Fung. Car. Sup. No. 554.)

VOLVARIA.

Volvaria bombycina. (Stevenson, p. 183. Fries Epic , p. 182.)

Volvaria Peckii. Pileus thin, convex, glabrous, viscid, finely striate on the margin, whitish; lamellae rather close, thin, pale flesh color; stem slightly tapering upward, glabrous solid, whitish, with a loose, well developed membranous volva at the base; spores even, subelliptical, 7-10 mc. long, 5-6 mc. broad, stem 7-9 cm. long, 6-8 mm. thick. (Peck, 48th Report.)

Volvaria Loveiana. (Stevenson p. 184. Fries Epic., p. 182.)

Volvaria parvula. (Stevenson p. 186. Fries Epic., p. 184.)

Volvaria striatula. Pileus thin, convex or nearly plane, minutely silky, striate on the margin and somewhat reticulate when dry, white; lamellae narrow, free, white, becoming flesh color ; stem short, glabrous, white, with the cup-like remains of the membranous volva at the base ; spores subglobose, uninucleate, 7 mc. long, nearly as broad. Pileus 1-2 cm. broad ; stem about 3 cm. long, 1-2 mm. thick. Wet ground under weeds. (Peck, Bull. Torr. Club. Vol. 22, p. 488)

Volvaria pubescentipes. Pileus convex, dry, white, clothed with minute hairy squamulose or reflexed fibrils, fimbriate on the margin; lamellae close, free, white, then flesh colored, sometimes minutely serrated or eroded on the edge; stem slender, subequal, pubescent; volva subappressed, white; spores elliptical, 6-7 mc. long, usually containing a single nucleus. Plant about 2 cm. long, pileus 1-2 cm. broad, stem 2 mm. thick. (Peck, 29th Report.)

Volvaria volvacea. (Stevenson p. 183. Fries Epic., p. 182.)

Volvaria Taylorii. (Stevenson p. 184. Fries Epic., p. 183.)

Volvaria emendatior. Pileus 7 cm. across, flat, with an obtuse umbo, smooth white; margin thin striate; stem 7 cm. high, 8 mm. thick, slightly incrassated above and below, very slightly arachnoid-fibrous, solid, volva forming merely a rim; gills ventricose, remote, free and rounded behind, white, at length flesh colored, extending in front beyond the ragged margin of the pileus as in Montagnites. Spores broadly cymbiform, 5 mc. long. Smell disagreeable but not strong. In the northern State the pileus is areolate. On rich garden soil. (Berk., Ann and Mag. Nat. Hist. Vol. 4, 3rd ser., p. 288.)

Volvaria viscosa. Pileus fleshy, campanulate-convex, smooth, very viscous, fulvous-ochraceous; stipe prominently bulbous, nearly equal above, solid, smooth, ochraceous; volva ample, lobed, concolorous; lamellae touching, brown; spores ovoid-ellipsoid, dilutely flesh colored, with a large nucleus, 8-5 mc. Pileus 6 cm wide; stipe 6 cm. long, at base 1½ cm. wide, above ½ cm. (Clements Botanical Survey of Nebraska, No. 2)

Volvaria speciosa. (Stevenson p. 185. Fries Epic., p. 183.)

Volvaria gloiocephala. (Stevenson, p. 185. Fries Epic., p. 183.)

APPENDIX II.

CORRECTION.

Under Chitonia it was stated in first part of this work that no species had been recorded from the United States. We have since learned that Clements has described a new species under the generic name Clarkeinda, and it was overlooked from that fact. I do not approve at all of the application of the Rochester rules to cryptogams. It would result in an endless confusion in regard to nomenclature and retard the study fifty years. The Lord knows we have enough troubles to contend with now without adding new and needless ones.

Chitonia plana. Pileus carnose, applanate, exactly plane, even, glabrous, ochraceous, or slightly fulvous; stipe short, stout, solid, attenuate above, fibrillose–squamulose, becoming fulvous; volva ample, adpressed, membranaceous; lamellæ free, ventricose, crowded, black–cinnamon–colored; spores short ellipsoid, or globose, uniguttate, purple–fulvous, 4-6x6-6 mc. Pileus 7 cm. wide; stipe 3 cm. high, 2 cm. thick. On manured ground. Described by Clements in recent number of Bot. Serv. of Neb., IV., p. 23.

APPENDIX III.

The natural tribes of the old genus Agaricus.

We would arrange the various genera which formerly were included in the Friesian genus Agaricus under the following tribes. There is nothing new in this arrangement as it was proposed by W. G. Smith nearly thirty years ago, but no author has adopted it. It is admitted that the usual system where the genera are arranged primarily by the color of the spores is purely artificial, corresponding to the Linnaean system in the flowering plants. The following arrangement is in keeping with the natural affinities of the genera, and it seems to us would greatly facilitate the study. A beginner meeting an Omphalia would be impressed with the characters of all the Tribe Umbilicae, and as a matter of fact will soon learn to ascribe to the proper tribe, on sight, any specimen he may meet. It only remains to determine the color of the spores (which after a little experience he will guess correctly almost every time from the color of the gills) to know the genus.

Most of the terms used in the tables are self-explanatory, but the distinction between the fleshy and cartilaginous stem is very apt to puzzle one at first. A cartilaginous stem is usually like a tube with a *smooth*, *even* often polished surface and tough. A fleshy stem is more brittle, and the surface is dull and under a glass seems as if made of fibers. We learn to recognize these stems by experience but it is hard to describe them.

The term "Pileus distinct from the stem" is explained in Note o, page 1 of the Volvæ. In order to determine whether the margin of the pileus is at first straight or involute, *very young* specimens must be examined. It is important to always note this point in a plant of Series 3. Some plants with the general appearance of Collybias are placed in Mycena, be–cause the margins of the young pilei are straight.

Series 1.

Pileus distinct from the fleshy stem.

Plant furnished with a volva. Tribe 1. ***Volvae.***

Plant without volva, ring present. Tribe 2. ***Annulae.***

Plant with neither volva or ring. Tribe 3. ***Exannulae.***

Series 2.

Pileus confluent and homogenous with the fleshy stem.

Plant with a ring. Stipe central. Tribe 4. ***Armillae.***

Plant without a ring. Gills attached with a sinuate tooth. Stipe central. Tribe 5. ***Dentae.***

Plant without ring. Gills decurrent. Stipe central. Tribe 6. ***Clivae.***

Stipe excentric or pileus laterally attached. Tribe 7. ***Excentrae.***

Series 3.

Stipe cartilaginous.

Gills not decurrent. Pileus explanate, margin at first involute. Tribe 8. ***Explanae.***

Gills not decurrent. Pileus campanulate, margin at first straight. Tribe 9. ***Campanulae.***

Gills decurrent. Pileus umbilicate. Tribe 10. ***Umbilicae.***

	Spores White.	Pink.	Ferrüginous, Light Brown, Sepia Brown.	Purple or Vandyke Brown.	Black.
Series 1.					
Tribe 1, Volvae,	Amanita,	Volvaria,	Locellina,	Chitonia,	.....
Tribe 2, Annulae,	Lepiota,	Annularia,	.....	Psalliota,	.....
Tribe 3, Exannulae,	Schulzeria,	Pluteus,	Pluteolus,‡	Pilosace,	.....
Series 2.					
Tribe 4, Armillae,	Armillaria,	.....	Pholiota,	Stropharia,	Anellaria,
Tribe 5, Dentae,	Tricholoma,	Entoloma,	Hebeloma,*	Hypholoma,	Panaeolus,
Tribe 6, Clivae,	Clitocybe,	Clitopilus,	Flammula,	.....	.....
Tribe 7, Excentrae,	Pleurotus,	Claudopus,	Crepidotus,	.....	.....
Series 3.					
Tribe 8, Explanae,	Collybia,	Leptonia,	Naucoria,	Psilocybe,	.....
Tribe 9, Campanulae,	Mycena,	Nolanea,	Galera,	Psathyra,	Psathyrella,
Tribe 10, Umbilicae,	Omphalia,	Eccilia,	Tubaria,	Deconia,	.....

‡Stipe subcartilaginous but otherwise closely related to Pluteus.
*Including Inocybe.

SYNONYMS.

The following names, considered now synonyms have been used in descriptions of American species. The name of the author given is not the authority for the name but the author who used it.

Amanita affinis, Frost, ...	equals	Amanita	Frostiana.
" aurantica, Schw., ...	"	"	Caesarea.
" badia,† Peck, ...	"	"	vaginata.
" bulbosa, Schw., ...	"	"	phalloides.
" bulbosa, Rav., ...	"	"	Ravenelii.
" Ceciliae, Peck, ...	"	"	strangulata.
" citrina,* Schw., ...	"	"	phalloides.
" formosa,† Peck, ...	"	"	muscaria.
" incarnata, Schw., ...	"	Volvaria	bombycina.
" livida, Schw..	"	Amanita	vaginata.
" muscaria var. minor. Peck,	"	"	Frostiana.
" muscaria var. major, Peck,	"	"	solitaria.
" onusta, Howe, ...	"	"	?
" pellucidula, Banning, . .	"	"	Caesarea.
" polypyramis, B. & C., . .	"	"	solitaria.
" pusilla, Schw., ...	"	Volvaria	parvula.
" soleata, Howe, ...	"	Amanita	volvata.
" spadicea, Schw., ...	"	"	vaginata.
" umbrina, Schw., ...	"	"	pantherina.
" virescens, Schw., ...	"	"	phalloides.
" virgata, Schw., ...	"	Volvaria	volvacea.
" viridis, Schw., ...	"	Amanita	phalloides.
Volvaria pusilla, Schw., ...	"	Volvaria	parvula.

*In reality this name was first used by Schaeffer, is now considered in Europe a synonym for mappa.

†Name used only as a synonym.

INDEX.

Names in ITALICS are synonyms.

AMANITA.

VOLVARIA.

THE GENERA

.....OF.....

GASTROMYCETES.

ILLUSTRATED WITH 49 FIGURES.

BY C. G. LLOYD.

CINCINNATI, OHIO, U. S. A. JANUARY, 1902.

W. G. FARLOW

INTRODUCTION.

a b

Fig. 1.
a—A basidium, bearing spores.
b—An ascus, containing spores.

Fungi, the larger fungi, are divided into two classes, 1st, the Basidiomycetes, which have the spores borne free on a basidia; 2nd, the Ascomycetes, which have the spores borne in a sack called an ascus. In this pamphlet we have to deal only with part of the first class.

The Basidiomycetes can in turn be divided into two very natural classes, 1st, the Hymenomycetes, those that have the spores exposed and free from the beginning, or at least from a very early state; 2nd, the Gastromycetes, those that develop the spores in cavities or chambers *within the tissue of the plant.* We are aware that these divisions are not in keeping with the very latest authorities which primarily divide the Basidiomycetes into sections based respectively on septate or nonseptate basidia; but we believe that these latter divisions while possibly theoretically correct, tend only to confuse matters excepting to the advanced and expert student.

It should not be inferred from the above that in order to recognize the Gastromycetes it is necessary to study the nature of the basidia, or make other minute anatomical examination. As a matter of fact, the merest tyro soon learns to recognize on sight the various phalloids, bird-nest fungi, and various kinds of "puff-balls" constituting the Gastromycetes and they were well classified before their anatomical structures were known.

Terms used in the description of the Gastromycetes.

PERIDIUM.

The shell or hull, enclosing the spore mass of a gastromyces is called the peridium. It varies in the different genera, the simplest type is a simple, uniform layer such as surrounds the spore mass in the accompanying cut of Scleroderma. (Fig. 2.) Usually however, the peridium consists of two distinct layers, called the outer peridium or exoperidium and the inner peridium or endoperidium. In Geaster, the outer peridium is thick and when the plant (*) ripens it splits in a stellate manner separating from the inner peridium and becoming more or less reflexed.

Fig. 2.
Section of a Scleroderma.

(*) In speaking of the "plants" it will be observed that we do not use precise language for what we call the "plants" are really the fruit bodies, compound sporophores, of the fungi, corresponding to the fruit of flowering plants, but it seems more natural in a work intended largely for general distribution to call a "puff-ball" or a "toad-stool" a plant than a fruit body. The vegetative portions of fungi, corresponding to the stem of flowering "plants" are thread-like growths called the mycelium, that permeate the soil or rotten wood, and which in reality bear the fruit bodies, or sporophores, that we have chosen here to call plants.

(See Plate 8, figures.) In Lycoperdon, Bovista, and many genera, the outer peridium is a thin, friable coat, often bearing spines or warts. As the plant matures this membrane usually peels off and disappears. (See Fig. 3.) When the outer peridium is of this nature it is called the cortex. In the genus Mitremyces the outer peridium is a thin membrane covered with a thick gelatinous mass. (See Plate 5, Fig. 29.) As the plant ripens this thin membrane breaks into little pieces which curl up and fall off carrying the thick gelatinous coat with them. All phalloids are in the young state enclosed in a thick, gelatinous membrane corresponding to a peridium, and called the volva. The outer peridium of Mitremyces is also usually called the volva. The phalloid is only enclosed in its volva during its young or "egg" state. (See Plate 1, Fig. 16.) When the plant grows the volva is ruptured at the apex, and remains as a cup at the base of the plant. (See Plate 1, Fig. 15.)

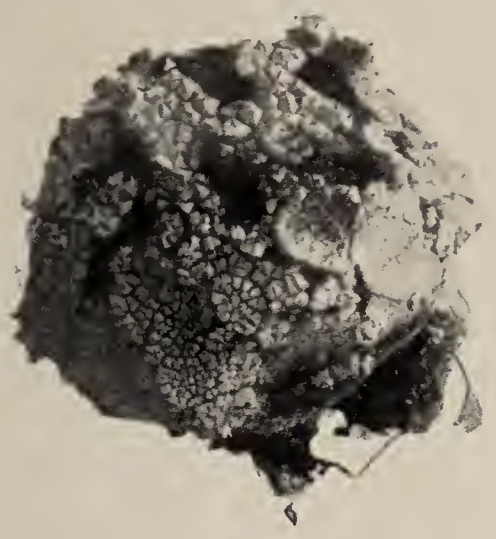

Fig. 3.
A Lycoperdon with the cortex peeling off.

THE STEM OR STALK.

Many genera of Gastromycetes, (Lycoperdon, Bovista, etc.,) are entirely destitute of any stalk or stem, but other genera (Tylostoma, Queletia, etc.,) are characterized by having the peridium borne on a distinct stalk. The base of the peridium of Lycoperdon, (see Plate 10, Fig. 45,) or Calvatia, is often contracted into stalk-like appearance, but must not be confused with the true stem of such genera as Tylostoma. Stalked gastromycetes are readily divided into two tribes: Tylostomeae in which the stalk is entirely distinct from the peridium and Podaxineae in which the stalk is continuous, forming an axis reaching the apex of the peridium.

THE GLEBA.

The inside of an immature puff-ball is filled with a white fleshy mass of soft cellular matter called the gleba.

Our study of the Gastromycetes has been confined to the mature specimens in our collection, but it will not be amiss to give the developments as recorded by De Bary, (whom we have for the most part copied in some sentences literally) Tulasne, Corda, Berkeley and others to whom we are indebted for our knowledge of the minute structure of the gleba. At first it is simply a cellular mass, but as the plant grows it gradually assumes the form of a tissue of minute chambers. The chambers of the gleba are in countless numbers, usually too small to be seen by the naked eye, and are narrow, irregularly curved, branched cavities, separated from one another by their curved plates

of tissue which anastomose with one another in every direction. In the accompanying cut (Fig. 4) the chambers of the gleba can be seen with the eye (if the printer does justice to the cut); the chambers of the sterile base are very large and evident. The walls of the

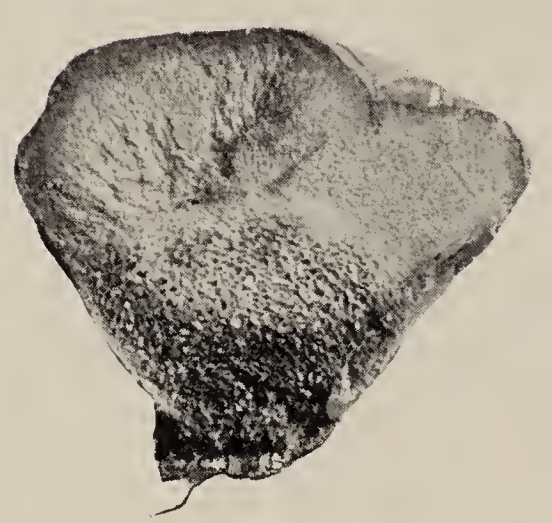

Fig. 4.
Section of a young Lycoperdon.

Fig. 5.
An ideal enlarged chamber of the gleba of Geaster.

chambers consist of layers of branched hyphæ bearing a hymenial layer on both surfaces which line the interior walls of the cavities. The hymenial hyphæ terminate in basidia bearing usually four spores. The figure which we give herewith (Fig. 5) taken from Engler & Prantl, (originally from Tulasne) of an enlarged gleba chamber illustrates this structure. In this figure the hyphæ constitute the thread-like tissue forming the walls of the chamber, the basidia are seen to bear four sessile spores.

In Scleroderma, Geaster hygrometricus, Polysaccum, and in certain other genera, all the hyphæ which enter a chamber are elongating, copiously branched, and woven together into a loose mass filling the chamber. (Fig. 6.) Plants possessed of this structure form

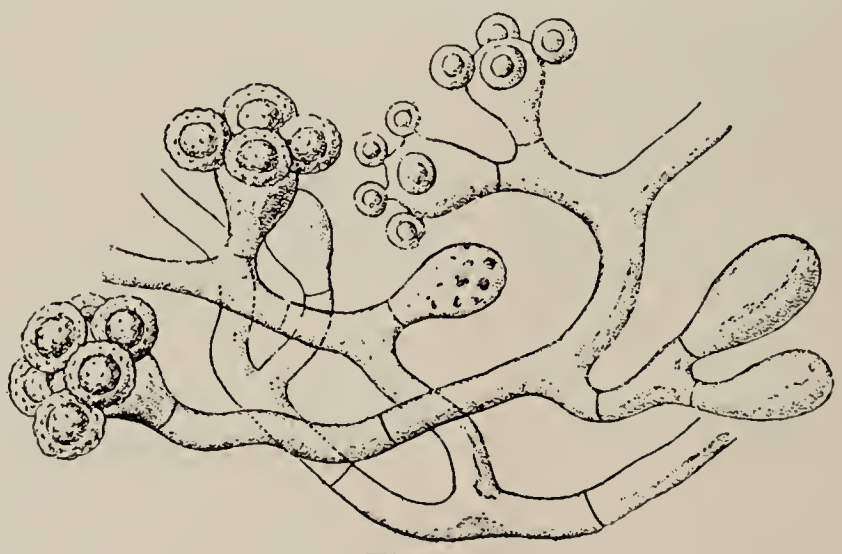

Fig. 6.
Basidia (enlarged) of Scleroderma.

the order Plectobasidineae of Fischer, but we think even if theoretically correct, it is not a matter of policy to classify plants by minute

anatomical differences which only an expert microscopist can trace and concerning which the ordinary student knows nothing excepting that which he reads.

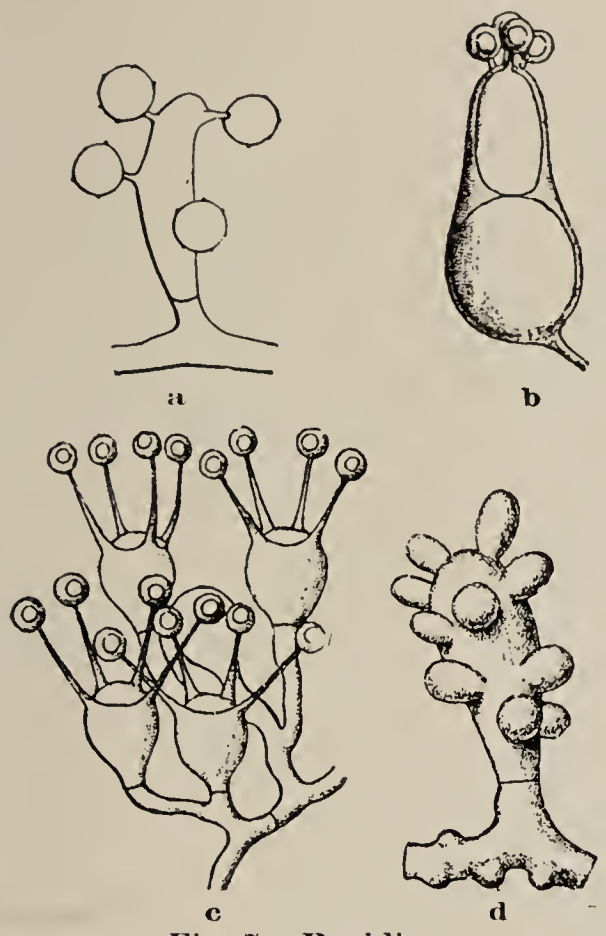

Fig. 7. Basidia.
a—Tylostoma. c—Bovista.
b—Geaster. d—Mitremyces.

BASIDIA.

If we believed in the German scheme of classification we would consider the basidia the most important part about a gastromyces and all other characters subservient to them. We are told that the basidia are of various shapes and that in some plants they form a lining to the gleba chambers. The way the spores are borne on the basidia is also characteristic; in Geaster they are almost sessile; in Bovista the spores are borne on long stalks called sterigmata; in Tylostoma and Mitremyces they are almost sessile and lateral. The number of spores also vary from four in Lycoperdon to a dozen or more in Mitremyces as shown in our cuts. These cuts copied from Engler & Prantl were originally from several authors. (*)

THE RIPENING OF PUFF-BALLS.

One of the most curious phenomena in connection with these plants is the change that takes place when the spores ripen. As the young plant grows the interior is a solid, white, firm, fleshy mass. When it reaches full size and ripens the tissues deliquesce, become moist, discolored, the tissues of the tramal chambers are absorbed and disappear, and finally the water dries away, leaving the peridium filled with a dry, dusty mass, usually consisting of slender threads and countless multitudes of ripe spores. This is now called the spore mass and the threads capillitium. The phenomenon of ripening in all Gastromycetes I believe is attended with deliquescense and absorption of more or less of the hyphal elements of the gleba, but the walls of the chambers do not in all genera disappear.

(*)We have given thus the detail of the minute structure of Gastromycetes as it is the basis of modern classification. Personally we do not approve of it. Assuming that it is the correct theory the time is not ripe for it. The basidial structure of comparatively few species is known. With by far the greater part of them and many genera the basidial structure is only conjectural. It seems to be the tendency of some writers to select the most obscure and difficult points on which to base classification. This has one advantage, it gives an air of greater learning. For our part we feel that a system based on points of difference of the mature plant obvious to the student, is more satisfactory and rational. To our mind there is no room in any *Natural* system of classification for the Nidulariaceae between Astræus (admitting the genus for argument) and Geaster, no matter what their basidial structure may be.

PERIDIOLES.

In the Nidulariaceæ or "bird-nest fungi" the walls thicken and each chamber remains as a separate, little seed-like body enclosing the spores. This is called a peridiole. (See Fig. 8.) In Arachnion the

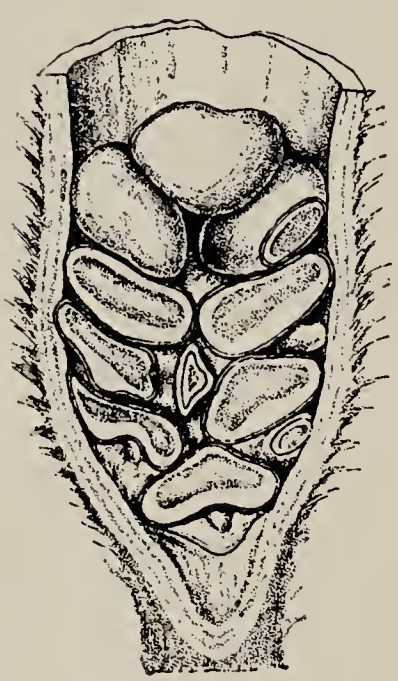

Fig. 8.
Section (enlarged) of a Cyathus, showing peridioles.

Fig. 9.
Polysaccum with upper portion breken off, showing peridioles.

"puff-ball" is filled with sack-like peridioles appearing to the eye as grains of sand. In Polysaccum (see Fig. 9) the peridioles are large and only partially separated from each other, the interior of a broken plant having the appearance of being honeycombed. In Scleroderma the walls of the gleba chambers are more or less permanent in the different species. In some specimens of S. bovista they remain almost perfect and approximate Polysaccum. In most species of Scleroderma however, only fragments of the walls are mixed with the spores.

CAPILLITIUM.

The threads that are contained in the spore mass of various Gastromycetes, though absent in many genera, are characteristic in each genus that has them, and are important factors in classification. How much longer I do not know, but certainly as far back as 1876, the peculiarities of the capillitium of the different genera were described and illustrated by Hesse.

There are two distinct types of capillitium threads. 1st, the threads are long hair-like strands, simple or more or less branched and interwoven, (see Fig. 11) proceeding from the inner walls of the peridium or the columella of the plant. 2nd, the threads are relatively short and branched, each entirely separate and distinct from the other (see Fig. 10), though the branches are usually interwoven, and have no connection with the peridium or columella. The latter type is characteristic of Bovista, Bovistella and Mycenastrum. Threads of the first type are usually broken into short fragments in the ripe spore mass, but are readily distinguished from those of the second type by the blunt ends of the fracture. Threads of the 2nd type when perfect run out in all directions into sharp pointed branches. (*)

Fig. 10.
A Capillitium thread (magnified) of Bovista.

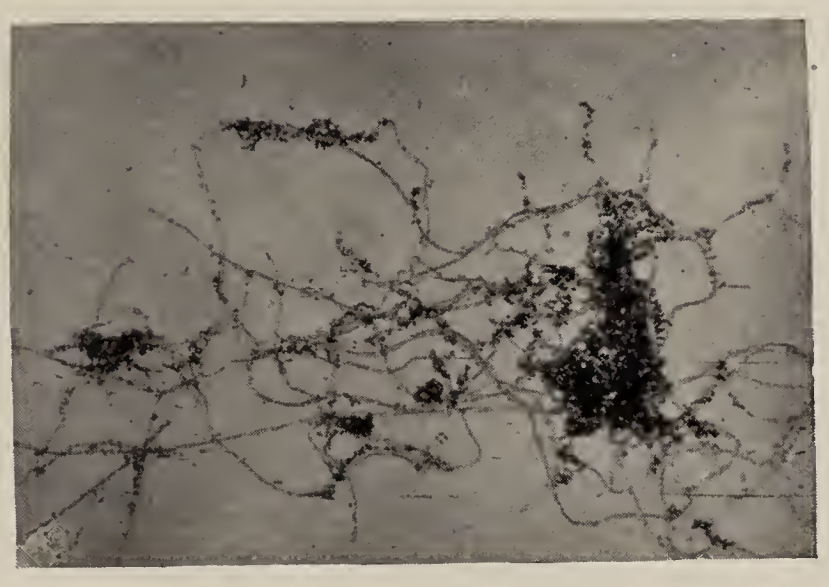

Fig 11.
Capillitium of Tylostoma. (magnified.)

Capillitium threads have varying character in different genera. In Calvatia they are long, branched, and interwoven. In Catastoma, mostly broken in short fragments. In Tylostoma often septate. In Mycenastum they bear little spiny processes. Usually they are colored, sometimes hyaline.

The hyphal strands that persist as capillitium are shown by Tulasne as penetrating and passing through the walls and chambers of the gleba. We can readily understand this structure in such genera as Lycoperdon where they are attached to the peridium or columella, but the exact attachment is obscure to our mind where they are "separate threads"

(*) Capillitium threads are relatively large microscopic objects, often visible to the naked eye and readily examined under low (1 inch lens) magnifying power. By simply pressing a fragment of spore mass on a slide the nature of the threads can usually be readily made out. To secure separate threads of Bovista type put a little spore mass in a small vial half filled with alcohol. Agitate violently and pour the alcohol over a clean slide, and separate threads can be readily floated out.

SPORES.

The ripe spores of Gastromycetes are readily examined under a microscope (¼ inch power is the best) and afford characters useful in distinguishing species. Some spores are smooth, some spinulose; more are globose but some are oblong or oval. They vary also in size and in color. Some spores are borne on the basidia on long sterigmata (see fig. 7c) which as the spores ripen persist attached to the spore and are known then as pedicels. (See Fig. 14.) The value of pedicellate

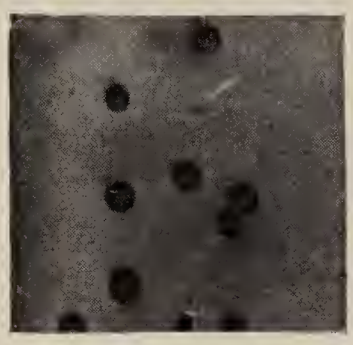

Fig. 12.
Globose spores of Mitremyces lutescens.

Fig. 13.
Oblong spores of Mitremyces cinnabarinus.

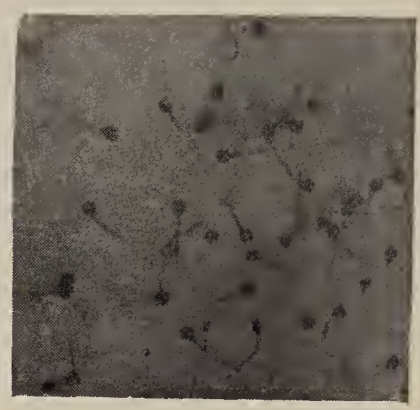

Fig. 14.
Pedicellate spores of Bovista

spores as a specific character is a disputed question. I am convinced that in some species the persistence of the pedicel depends on the stage of development when the plant is collected as I have found pedicellate and non-pedicellate spores in different plants of same species and of same collection. Massee says the pedicels of spores of old herbarium specimens are always broken off, hence the character of no value. We know however, that there are certain species such as Bovistella Ohiense, Bovista plumbea, in which the pedicellate spores are constant and persist for years, and we feel that in such cases the character is of value, even if it does disappear with age.

STERILE BASE.

In Lycoperdon, Calvatia and other genera, all portions of the gleba are not fertile and spore bearing. The lower portion called the "sterile base" consists simply of sterile cells or threads. The "sterile base" has been made a character to distinguish genera, Globaria of recent writers being simply Lycoperdon devoid of a sterile base. While it is a good primary character to divide the genus Lycoperdon, there are all shades of development from species with none at all, through species with very little, to species with it strongly developed, and I feel that it alone should not be held of generic importance. Several species shed their spores but the sterile bases persist through the winter and are often picked up for perfect plants. Bosc described and illustrated Calvatia cyathiformis on such a remnant, thinking it was a perfect plant.

HISTORICAL.

As previously stated, we do not believe in the recent German classification of Gastromycetes based on minute anatomical differences such as basidia. A natural system drawn from characters found in the mature plants has been evolved gradually, can be readily understood, and plants can be identified by anyone with little trouble. There is no department of mycology where there is so much confusion as in the Gastromycetes, and it is a most puzzling task to try and trace the species through the writings of the various authors. While it is necessary for us to study the history of the plants, we do not attach the importance to solving these old time puzzles that we do to the study of the plants themselves. Saccardo's Gastromycetes is probably the poorest compilation of all his volumes. Sclerodermas, Mycenastrums and Bovistellas; Bovistas, Catastomas and Globarias,* are all jumbled indiscriminately together and often the same species appears under two or three different names. Absence of illustrations, or crude attempts at it on the part of authors, are responsible for much of this trouble. Endeavors on the part of authors, such as Fries and Persoon, to classify species that they know nothing of, on these crude illustrations further contributed to the confusion. In our pamphlet we shall make no attempt to compile genera or species that we have not in our collection or have not seen and studied. Most of our specimens have been submitted to Bresadola and Patouillard, in our opinion the best authorities in the world.

In our country there have been three important workers with the Gastromycetes, Peck, Trelease and Morgan. Prof. Peck wrote an account of the New York species of Lycoperdon which appeared in the 32nd Report (1879). This is a very plain description of the species that he had seen and studied as they grew, and is one of the best accounts that has appeared. Those who live in the Eastern section of our country, can take this old monograph and make out most all the Lycoperdons that they find. Practically the same paper, to which was added a compilation of species described which he had not met, was published in the Transactions of the Albany Institute under the title of "United States Species of Lycoperdon." A paper on "The morels and puff-balls of Madison (Wisc.)," by Prof. Trelease, appeared (1889) in Transactions of Wisconsin Academy of Sciences. This article gives evidence of great study and research, and the conclusions Prof. Trelease reached are mostly maintained at the present day. Unfortunately, the paper is illustrated by most miserable figures.

Prof. Morgan has probably done more work on the Gastromycetes in this country than any other man, wrote four papers on the subject that were published in the Journal of the Cincinnati Society of Natural History (1889 to 1892). The field was not completely covered as the work was not completed. Morgan made a critical study of the internal structure, especially the capillitium of "puff-balls," and established several new genera that are universally recognized.

(*) Using the term for convenience for Lycoperdon without sterile base.

CLASSIFICATION.

Gastromycetes can be readily divided into four families widely differing from each other as to the nature of the mature plants.

FAM. 1.—PHALLOIDEAE.—PHALLOIDS. Plant fleshy, enclosed in a gelatinous volva when young. The gleba deliquescing and becoming a mucilaginous (generally foetid) mass.

Phalloids are noted for the foetid odor that they have and for their bazarre shapes. They force themselves to the attention of the most unobserving and are often called such appropriate names as Stink Fungus, Stink Horns, Dead Mens' Fingers. Our most common species are Phallus duplicatus, and Phallus Ravenelii. In the South, Clathrus columnatus.

FAM. 2.—NIDULARIACEAE.—NEST FUNGI. Plants shaped like little cups, opening at the top, and containing a number of little seed-like bodies (peridioles). They look something like little birds' nests and are often called "Birds-nest fungi." Crucibulum vulgare and ~~Nidularia~~ striatus are our most common species.

Cyathus.

FAM. 3.—HYMENOGASTRACEAE.—HYPOGEAL FUNGI. Peridium indehiscent; gleba cavities permanent, not resolved into a mass of spores; capillitium absent.

This family is mostly subterranean like the true tubers or truffles. Harkness has recorded many species from the Pacific Coast, and we have seen three from the section east of the Mississippi. It is probably that many occur but have been overlooked on account of their subterranean habits.

FAM. 4.—LYCOPERDACEAE.—PUFF BALLS.—Ripe peridium enclosing a mass of dry spores, often mixed with capillitium. Sometimes the gleba walls persist forming peridioles, but in those cases the peridioles are filled with a mass of dry powdery spores.

The largest and most frequent tribe of Gastromycetes and embracing all the families known as "Puff-balls."

GENERA OF LYCOPERDACEAE.

For the time being we will pass over the genera embraced in the first three families and enumerate the genera with which we are familiar, of the "puff-ball" family. We would divide the plants into four tribes.

TRIBE 1.—TYLOSTOMEAE.—Plant stalked. Stalk distinct from the peridium. Capillitium present.

Peridium opening by an apical mouth,
- Volva indistinct, adherent, ... TYLOSTOMA.
- Volva cup-like, ... CHLAMYDOPUS.

Peridium circumscissal, ... BATTARREA.

Peridium opening irregularly,
- Volva none, ... QUELETIA.
- Volva thick, permanent, ... DICTYOCEPHALOS.

TRIBE 2.—PODAXINEAE.—Plant stalked. Stalk continuous to the apex of the peridium forming an axis.

Gleba with irregular persistent chambers,
- Peridium, club-shaped, ... CAULOGLOSSUM.
- Peridium, round or conical, ... SECOTIUM.

Gleba with sinuate, lamellate plates, ... GYROPHRAGMIUM.
Walls of the gleba chambers not persistent, ... PODAXON.

TRIBE 3.—SCLERODERMEAE.—Plant not stalked, or stalk short, confluent with the peridium. Capillitium none.*

Peridium of a single layer,
- Walls of the gleba chambers persistent forming peridioles, ... POLYSACCUM.
- Walls of the gleba chambers most disappearing or only partially persistent, ... SCLERODERMA.

Peridium, double,
- Outer peridium, thin (a cortex) . . . . . ARACHNION.
- Outer peridium, thick, gelatinous, ... MITREMYCES.

TRIBE 4.—LYCOPERDEAE.—Plant not stalked. Spore mass, dry spores mixed with capillitium.

TRIBAL ALLIANCE 2.—GEASTRAE,—EARTH STARS.—Peridium double, outer peridium thick, persistent, splitting into segments and recurving.

Mouth, one, ... GEASTER.
Mouths, several, ... MYRIOSTOMA.

TRIBAL ALLIANCE 2.—BOVISTAE,—TUMBLERS.—Outer peridium thin (cortex mostly peeling off). Inner peridium firm or papery. Mature plant loosened from place of growth.

Capillitium of separate threads, with slender pointed branches, ... BOVISTA.
Capillitium of separate threads bearing spiny points, ... MYCENASTRUM.
Capillitium threads broken into short fragments with blunt ends, ... CATASTOMA.

TRIBAL ALLIANCE 3.—LYCOPERDAE.—TRUE PUFF BALLS.—Outer peridium thin (cortex, mostly disappearing.) Inner peridium usually flaccid. Plants normally remaining attached to place of growth.

Capillitium of separate threads with slender pointed branches, ... BOVISTELLA.
Capillitium long threads more or less broken in fragments,
- Peridium, opening by definite mouth, LYCOPERDON.
- Peridium, irregularly ruptured, no lining membrane . . . . . CALVATIA.
- Peridium, irregularly ruptured, furnished with a lining membrane, ... HYPOBLEMA.

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*Basing the Tribe thus for convenience on the absence of capillitium, it embraces widely diverging genera, but we prefer to do this at least for the present rather than to multiply the tribes. Mitremyces is the type of a good tribe, Arachnion perhaps of another.

ILLUSTRATIONS.

We present herewith eleven plates illustrating the various genera. We expect to publish from time to time, pamphlets describing and illustrating the species of each genera.

Acknowledgement of Sources of Illustrations.

Fig. 1, 5, 6, 7, 8, copied from Engler & Prantl, (originally from various sources.)

Fig. 20, copied from drawing by V. S. White.

Fig. 10, 11, 12, 13, 14, 42, Microphotographs by Dr. Edward Thompson.

Fig. 9, 36, 37, Specimens from Mrs. Delia Sams, New Smyrna, Florida.

Fig. 17, 18, 35, Specimens from Simon Davis, Boston, Mass.

Fig. 21, 40, Specimens from A P. Morgan, Preston, Ohio.

Fig. 22, Specimen in collection of L. M. Underwood.

Fig. 23, Specimen from Dr. Wm. Herbst, Trexlertown, Pa.

Fig. 24, 26, 32, 49, Specimens in Ellis' Collection, New York Botanical Garden.

Fig. 25, Specimen from C. V. Piper, Pullman, Washington.

Fig. 27, Specimen from L. A. Greata, Los Angeles, Cal.

Fig. 30, 46, Specimens from Fred. J. Braendle, Washington, D. C.

Fig. 31, Specimen from Prof. A. J. McClatchie, Phoenix, Arizona.

Fig. 38, Specimen from Caroline A. Burgin, Philadelphia, Pa.

Fig. 39, Photograph from Fred. J. Braendle, Washington, D. C.

Fig. 41, Specimen from E. Bartholomew, Rockport, Kan.

Fig. 43, Specimen from Mrs. Eugene Wright, Hubbard Lake, Mich.

Fig. 4, 48, Specimens from Geo. E. Morris, Waltham, Mass.

Fig. 2, 3, 15, 16, 19, 28, 29, 33, 34, 44, 45, 47, Specimens collected by author.

PLATE 1.

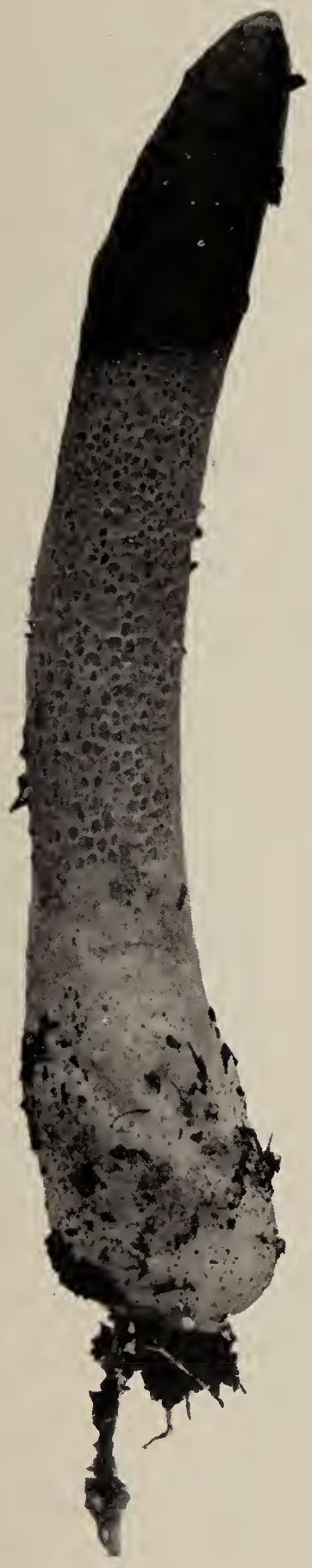

Fig. 15.
Mutinus elegans.

Fig. 16.
Section of egg. Mutinus elegans.

Fig. 17.
Section of Rhizopogon luteolus.

Fig. 18.
Rhizopogon luteolus

PLATE 2.

Fig. 19. Nidularia striatus.

Cyathus

Fig. 20.
Chlamydopus clavatus.

Fig. 21.
Tylostoma verrucosum.

Fig. 22.
Battarrea Griffithsii.

PLATE 3.

Fig. 23.
Queletia mirabilis

Fig. 24.
Cauloglossum transversarium.

Fig. 25.
Secotium acuminatum.

PLATE 4

Fig. 26.

Dictyocephalos curvatus. (Reduced one-third.)

PLATE 5.

Fig. 27.
Gyrophragmium Delilei. (Not perfect, wanting volva.)

a b

Fig. 28.
Arachnion album. a—plant. b—section.

Fig. 30.
Mitremyces lutescens.

Fig. 29.
Mitremyces cinnabarinus.

PLATE 6.

Fig. 31.
Podaxon Farlowii.

Fig. 32.
Catastoma subterranea.

Fig. 33.
Catastoma circumscissa.

Fig. 34.
Bovistella Ohiense.

PLATE 7.

Fig. 35.
Scleroderma verrucosum.

Fig. 36.
Polysaccum crassipes.

PLATE 8.

Fig. 37. Myriostoma coliforme.

Fig. 38. Geaster pectinatus

Fig. 39. Geaster triplex.

Fig. 40. Geaster hygrometricus.

PLATE 9.

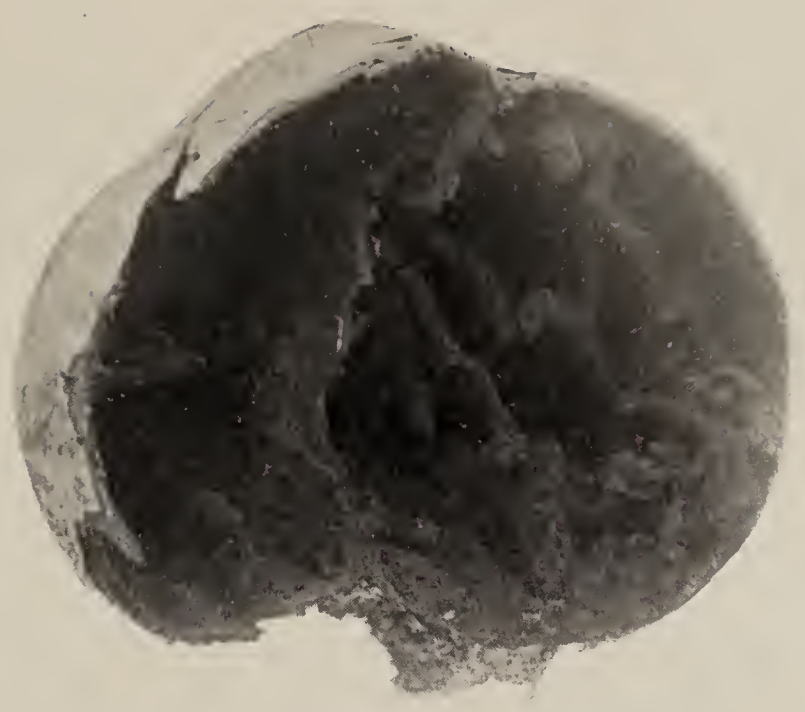

Fig. 41.
Mycenastrum spinulosum. (Section.)

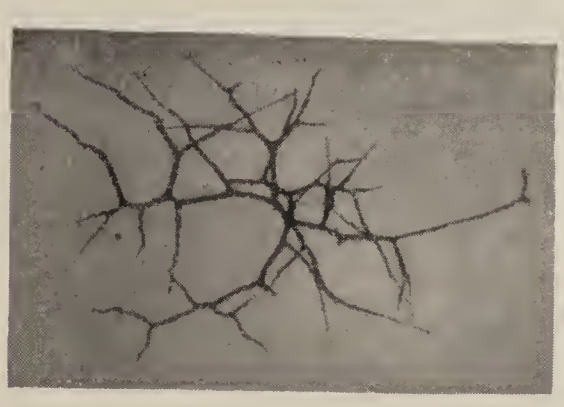

Fig. 42.
Capillitium of Bovista. (Magnified 80 diam.)

Fig. 43.
Bovista pila. (Mature.)

Fig 44.
Bovista pila. (Young.)

PLATE 10.

Fig. 45.
Lycoperdon muscorum.

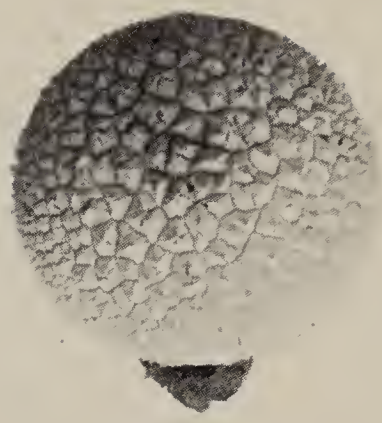

Fig. 47.
Lycoperdon cruciatum.

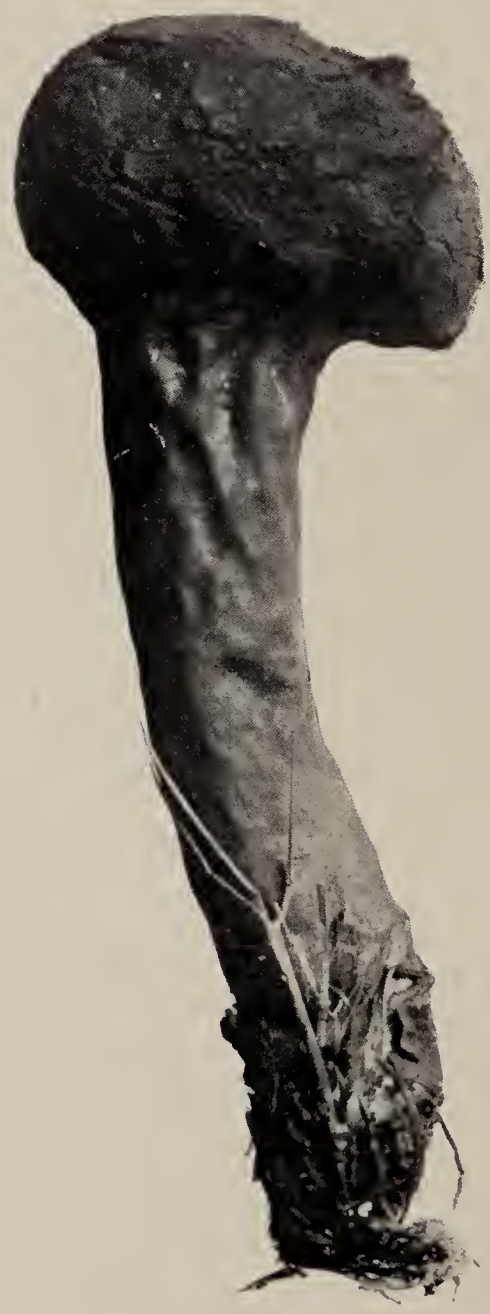

Fig. 48.
Calvatia elata.

Fig. 46.
Lycoperdon pseudoradicans.

PLATE 11.

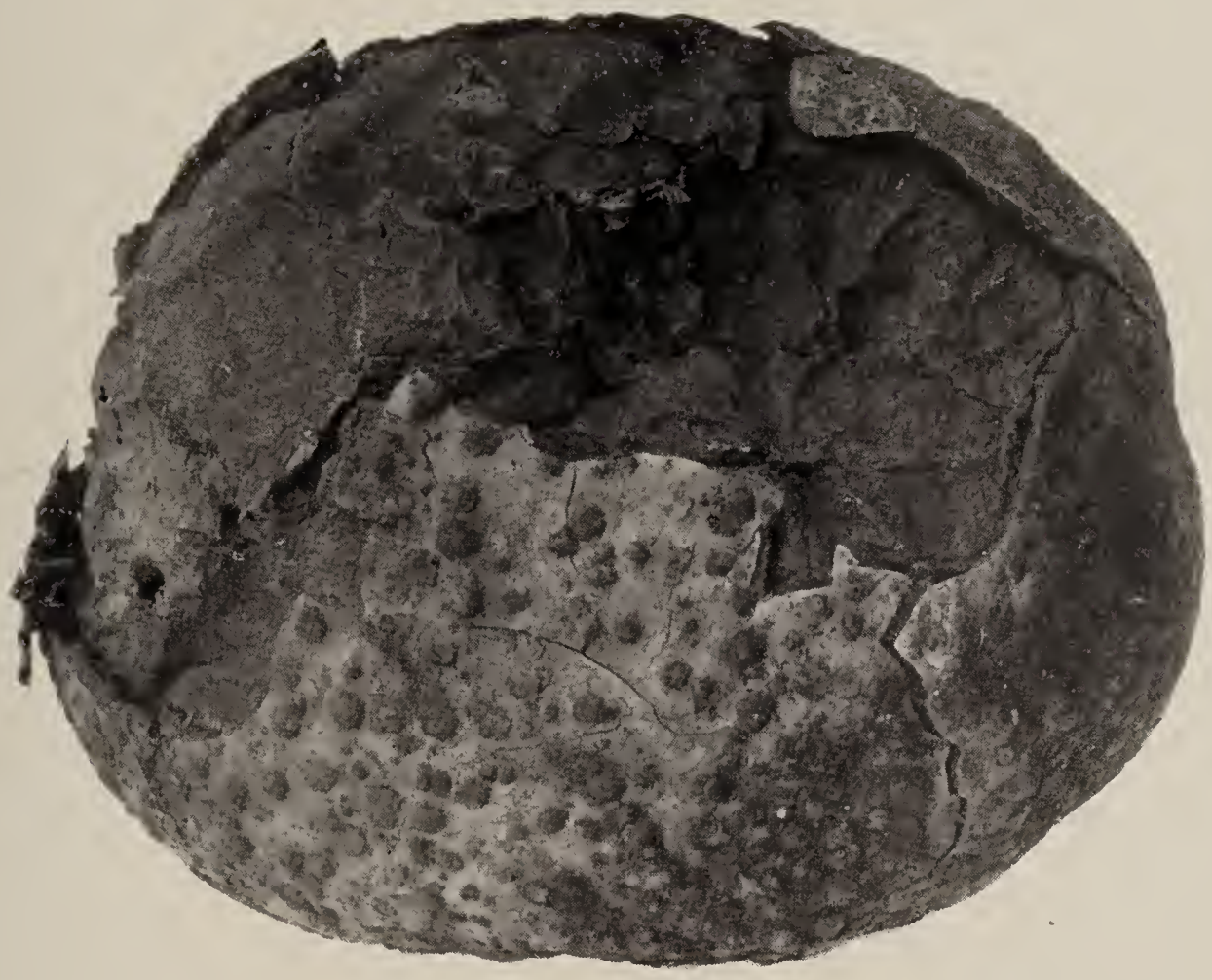

Fig. 49.

Hypoblema pachyderma

INDEX TO FIGURES

Illustrating Families and Genera.

FAMILY LYCOPERDACEAE.

THE

GEASTRAE.

ILLUSTRATED WITH 80 FIGURES.

BY C. G. LLOYD.

CINCINNATI, OHIO, U. S. A. JUNE, 1902.

W. G. FARLOW

GEASTRAE.

We have classed the Geastrae as a sub-tribe of the Lycoperdeae, the essential characters of which are plants sessile, spores mixed with capillitium. (See "The Genera of Gastromycetes, p. 11.)

Geastrae differ from the other Lycoperdeae in having the outer peridium thick, permanent, and when the plant ripens the outer peridium peels away from the inner, splits into segments and becomes more or less recurved or spreading.

THE MYCELIUM.

There are two distinct types of mycelium. Most Geastrae develop under the ground and the mycelial threads proceed from every portion of the outer peridium binding it to the soil. This is the usual type of most Geaster mycelii. In some species however, (see Fig. 57) the mycelium proceeds only from the base of the plant, and has the appearance of large cord-like roots.

THE OUTER PERIDIUM.

There are three distinct layers forming the outer peridium of a Geaster and they are quite evident to anyone who will closely observe them.

1st, the mycelial or outer layer,
2nd, the fibrillose or middle layer,
3rd, the fleshy or inner layer, also called the Collenchyma.

The Mycelial Layer.—This derives its name from the fact that in many cases in the growing plants, mycelium threads proceed from all parts of it and bind the plant to the surrounding soil. In plants of the section *Rigidae* it is fragile, and so closely attached to the soil that as the plant expands it tears away from the mycelial layer which remains attached to the soil. In herbarium specimens (see Fig. 8) of Geaster hygrometricus and others of the *Rigidae*, the outer peridium appears smooth, the mycelial layer having entirely disappeared. In most Geasters however, the mycelial layer remains more or less firmly attached to the fibrillose but the degree of attachment in different specimens, otherwise the same, is of no importance, merely a condition. In Geaster limbatus, most of the specimens have the two layers adnate but we have specimens that have the mycelial layer only slightly attached at the extremities of the segments, and specimens also where it has entirely peeled off. In some species, (fornicatus coronatus, radicans in particular) the mycelial layer remains as a cup, the fibrillose layer separates and arches up, tearing away, except at the tips of the segments which remain attached. Species with this character are called fornicate, and as it seems to have been supposed to have been the character of only one species called fornicatus, several have been confused under this name. As a matter of fact quite a number of species have this character in a more or less perfect degree. All Geasters have an outer layer which

for uniformity we call the mycelial layer, though inaccurately so-called in cases like G. radicans where the mycelium is basal.

The Middle or Fibrillose Layer.—This is usually the thickest and principal layer of the outer peridium and in many herbarium specimens is the only one that remains, the outer and inner layers having peeled off and disappeared. Its nature varies much in different species. In the *Rigidae* it is firm, thick, strongly incurved when dry, and strongly hygroscopic. When the plant is moist the segments reflex, and they curl in again when dried, and the process can be repeated as often as the plants are moistened and dried. Fig. 5 represents a dried plant as found in the herbarium, Fig. 6 is the same plant after having been moistened. All Geasters are to an extent hygroscopic and the simplest way to make a crushed specimen assume its normal shape is to place it a few minutes in a jet of free steam which puffs them out plump and natural. The photographs of many of the specimens we present would not be supposed to be the same specimen we received. In most species of Geaster the fibrillose layer instead of being firm as in *Rigidae* is to an extent flexible and in the only specimen we have seen of "G. turbinatus" it resembles parchment paper.

The Inner or Fleshy Layer—This layer differs very much from both of the preceding. When the plant opens it is thick, soft, fleshy, usually white or pinkish. As it dries it almost always turns dark reddish brown, dries down to a thin adnate layer, or splits up and peels off entirely or partially. A photograph of a Geaster taken with this layer fresh is quite different from the photograph of the dried specimen of the plant. Sometimes instead of drying down to a thin layer, if exposed to the weather it thickens, becomes spongy, torn. This is particularly the character of the fleshy layer of G. rufescens. In many species if specimen of the plant be dried when it first opens, the fleshy layer remains as a thin red adnate layer, whilst if left exposed to the weather the layer peels off and disappears entirely. Specimens collected in these different conditions appear like different plants. Sometimes the fleshy layer separates from the fibrillose, and remains as a kind of cup at the base of the inner peridium. This is purely an accidental character and while present in many specimens (see Fig. 47) is absent in others. It is the basis for such species as G. triplex, and made the *key character* in Saccardo. While we consider G. triplex a good species, it is on entirely different points from this feature, from which it receives its name.

Fig. 60 shows a specimen of G. coronatus in which a portion of the fleshy layer in peeling off has chanced to tear in a circumscissile manner and dried as a separate ring, which being too small to slip over the inner peridium remains as a loose collar at its base. It is needless to say that this is purely accidental and might never occur in another specimen.

THE INNER PERIDIUM.

The inner peridium of Geasters is generally dull, flaccid, soft. It is either globose or more or less ovate, often tapering to the base. Sometimes it is pedicellate, sometimes sessile and this feature is a primary character in several authors' classification. I do not however, feel that it is of primary importance for I think the length of the pedicel, in some species, is dependent largely on the extent that the outer peridium is reflexed or drawn away from the inner. Geaster rufescens I believe varies in having the inner peridium sessile or distinctly pedicellate.

THE MOUTHS OF THE INNER PERIDIUM are of three types. 1st, not defined but simply a torn aperture; 2nd, distinct, usually conical, but even. 3rd, strongly sulcate. I think Geasters are more strongly characterized by their mouths than by any other feature. In addition some Geasters have the mouths seated on a definite circular area strongly marked, and differing in shade of color from the balance of the inner peridium. Such mouths we call definite. In others the mouth is conical and distinct but is not marked with a definite area. Such we call indefinite. While the various species are characterized by having in general definite or indefinite mouths we think it is not rare that individual plants of a species usually having indefinite mouths may have a definite mouth or vice versa.

In addition to these characters above we read of "dentate" mouths especially in connection with G. rufescens, and such a mouth is clearly shown on Schmidel's drawing. We believe however, that it is purely in error, and as that error has been handed down in our descriptions for 150 years it is time we were rid of it.

We also read of fimbriate mouths, especially in connection with G. fimbriatus. Most Geasters of the even-mouthed series have appressed hairs around the mouth, and when the plant is old and weather worn these hairs become frayed and take on a fimbriate appearance, but that it is a character, I do not believe.

We have seen specimens with an even mouth, rimose, and appearing at first sight as if sulcate. That is simply the result of the way the plant dries and its occurrence is rare. It was from such a specimen Schaeffer (1761) drew his figure on which G. coronatus (fornicatus of many authors) was based, and hence the error that persists for 140 years that "Geaster fornicatus has a sulcate mouth." No fornicate species of Europe has to my knowledge a sulcate mouth.

"Pectinate" mouth is a term used in connection with Geasters. A pectinate mouth would be composed of narrow segments set parallel like the teeth of a comb. Such mouths are often shown in illustrations, as in Chevallier's cut of "G. minimus" and in Massee's beautiful but inaccurate figures of Geasters in the Annals of Botany. We do not think that such a mouth occurs in nature but are exaggerated conceptions of sulcate mouths. A plant with a sulcate mouth might have the divisions broken apart and thus become "pectinate," but we have never seen one and do not believe they occur.

CAPILLITIUM.

With the exception of the anomalous species, hygrometricus, the capillitium of Geasters consists of long unbranched threads that proceed from the columella and inner surface of the peridium.

The capillitium, in some species at least, is more firmly attached to the peridium and columella than usual in most Gastromycetes. Cut open a Geaster, shake out the spores, and with a hand glass abundant capillitium can be seen proceeding from both columella and peridium. Fragments of these threads are mixed with the spores, and these fragments as seen under the microscope are usually simple, cylindrical and tapering. The relative thickness of the threads as compared to the spores, we give in our descriptions as a matter of form. We place little value on it however, as the threads as well as the spores may vary in thickness.

SPORES.

With the exception of the anomalous species, hygrometricus, the spores of the species we have examined are very similar, all globose, all slightly warted, all about 3-5 mc. in diameter. Some are slightly larger than others, some slightly rougher than others, but the differences while evident by contrast are not sufficient to determine specific characters. Cooke describes species from Australia with "smooth" spores. We have never seen a perfectly smooth spore in a Geaster. G. hygrometricus can be known at once by its large rough spores 8-12 mc. in diameter.

The color of the spore mass of Geasters affords no distinction as it does in other genera. We find no species with pronounced olive or purplish spores. The usual color is a dark brown deepening to black.

COLUMELLA.

In our opinion one of the most striking points of difference between species is the shape of the columellæ, which varies from ovate, globose, or filiform. To study the columellæ however, the plant should be examined just before it expands. After the spores ripen the columellæ usually become indistinct. Vittadini seems to have been the only author who has observed and illustrated the columellæ in his plates.

SHAPE OF UNEXPANDED PLANT.

If we knew the shapes of the unexpanded plants, the best primary division of the genus would be in two sections. Plants with unexpanded forms, globose (see Fig. 41) and plants with unexpanded form, acute (see Figs. 48, 77). Unfortunately, however, we only know the unexpanded form of a few species, simply from lack of observation. We call attention of collectors especially to this point that in gathering Geasters it is particularly important to secure a few unexpanded plants or to make a note of their form. We hope should we issue a second edition of this pamphlet that we may have the data, and not be forced to admit our ignorance on this character of many of the species.

CLASSIFICATION.

The Geastrae consist of only two Genera, Myriostoma with but a single widely distributed species, and Geaster of which we are familiar with 22 species, and know imperfectly several others.

Geaster hygrometricus differs from other species widely in its internal structure It has no columella, (neither has other species) the capillitium is branched and interwoven and in mature specimens scanty as compared to other species; the spores are larger and approximate the spores of Scleroderma, and the spore mass closely resembles to the eye that of a Scleroderma. In De Bary's Morphology (English, 1887, pp. 313 and 314,) the points are clearly brought out. Morgan (1889) proposed for it the name Astraeus. Desveaux had many years before (1809) proposed the same thing and Corda (Icones Vol. 5) elaborated it, only they retained the name Geaster for this species, proposing to change the other species to Pleastoma. We do not feel that Geaster hygrometricus ought to be separated from other species which it so closely resembles in general appearance that it was for years confused with them, and which to-day frequently requires the use of the microscope to distinguish from other species. We certainly do not think it ought to be put in a different order (we do not use the word natural) as Fischer proposes, and if we did we would not put Nidulariaceae between it and Geaster.

KEY TO GENERA.

Mouths and pedicels several . . . . . Myriostoma.
Mouth and pedicel one . . . . . Geaster.

MYRIOSTOMA COLIFORMIS.

Exoperidium usually recurved, cut to about the middle to six to ten lobes; if collected and dried when first open rather firm and rigid; when exposed to weather, becoming like parchment paper by the peeling off of the inner and outer layers. Inner peridium, subglobose, sup-

Fig. 1.
Myriostoma coliformis.

Fig. 2.
Myriostoma coliformis.

ported on several, more or less confluent, pedicels. Surface minutely roughened ; mouths several, appressed fibrillose, round, plain or slightly elevated; Columellae several, filiform, probably the same in number as the pedicels ; spores globose, roughened, 3-6 mc. ; capillitium simple, unbranched, long, tapering, about half diameter of spores.

Fig. 3.
Myriostoma coliformis (section showing columellae.)

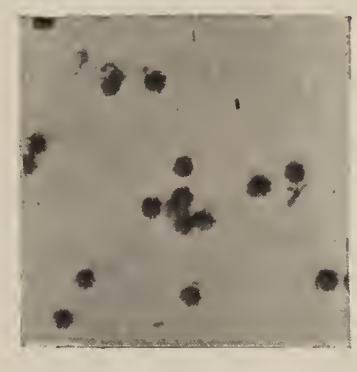

Fig. 4.
Myriostoma coliformis, (spores magnified.)

The inner peridium with its several mouths can be, not inaptly, compared to a "pepper-box." The specific name is derived from the latin *colum*, a strainer, and the old English name we find in Berkeley "Cullenden puff-ball" refers to a cullender (or colander more modern form) now almost obsolete in English but meaning a kind of strainer. This plant is first mentioned by Doody (in the appendix to Ray's Syn. 2nd Ed., 1696.*) Dickson (†) 1785, beautifully illustrated the plant and as it is such an odd plant it has never been confused in literature. Dickson called it Lycoperdon coliforme. Persoon (Syn. 1801) refers it to Geaster, and Desveaux (1809) proposed for it the genus Myriostoma. At the present day it is generally known as Myriostoma coliformis, though some writers (strangely to our mind) still continue to call it Geaster coliformis.

Geographical Distribution.

In Europe the plant is reported from England, Holland, Germany, and Poland, and develops abundantly in the sandy plains of Hungary. In England it is a very rare plant. In this country species were sent to Chas. Peck from Colorado. We have it from Dakota and abundantly from Florida.

Specimens in our Collection.

Florida, (many specimens) Mrs. Delia Sams.
Dakota, Black Hills, Prof. T. H. McBride.
Hungary, magnificent specimens, Dr. L. Hollos.

Explanation of Figures.

Figs. 1 and 2 plants natural size ; Fig. 3 Section showing columellæ; Fig. 4 Spores magnified 450 diameters. Specimens all from Mrs. Delia Sams, Florida. All figures in this pamphlet are natural size unless otherwise specified. All micro-photographs are by Dr. Edward H. Thompson.

(*) The previous citations of Ray to Merrett (1667) is more probably a Geaster.
(†) Fasc. Plant, Cryp. Britanniae.

GEASTER.

Exoperidium thick, divided into sections and usually recurved away from the inner peridium. Inner peridium sessile or stipitate with a single pedicel. Mouth only one. Capillitium (mostly) simple, unbranched. Spores globose, rough. We would divide the genus primarily into two sections.

Rigidae (see following).
Non-Rigidae (see page 14).

SECTION 1. RIGIDAE.

Exoperidium rigid, strongly incurved when dry, strongly hygroscopic.

This section is a very natural division of the genus readily recognized by the rigid incurved exoperidium segments of the dried specimens. All species of Geaster are hygroscopic to a more or less extent, but these are strongly hygroscopic. The mycelium covers the entire young plants and the layer is thin. When the plant expands the mycelium layer tears off and remains as fragments attached to the soil, hence the plants of this section as found in collections are smooth externally, and entirely devoid of mycelial layers.

Spores large, (8–12 mc.)	(1) hygrometricus.
Spores small, (4–6 mc.)	
Mouth indeterminate,	(2) delicatus.
Mouth strongly sulcate,	(3) Drummondii.
Mouth definite, even,	(4) mammosus.

1. GEASTER HYGROMETRICUS.

Unexpanded plant globose. Mycelium layer, thin, tearing away as the plant expands. Fibrillose layer thick, rigid, strongly hygroscopic, splitting into six to twenty segments becoming reflexed when the plant is moist; strong incurved and rigid when dry. Flesh layer thin, soon separating and often absent from herbarium specimens. Inner peridium globose, thin, opening by simply a torn aperture; columella none. Capillitium threads long, branched, about half diameter of largest spores. Spores large, globose, rough, 8–12 mc.

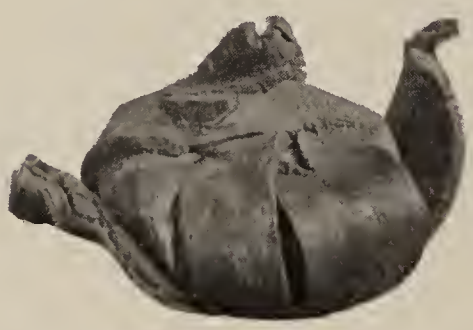

Fig. 5.
Geaster hygrometricus (dried specimen.)

Fig. 6.
Geaster hygrometricus (expanded specimen.)

This plant is fond of sandy localities and very common in many places. It develops under the ground and is of slow growth. Young plants received from W. N. Suksdorf grew in clumps, (see fig. 10)

Fig. 7.
Geaster hygrometricus (as it grows.)

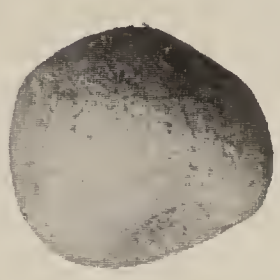

Fig. 8.
Geaster hygrometricus (unexpanded.)

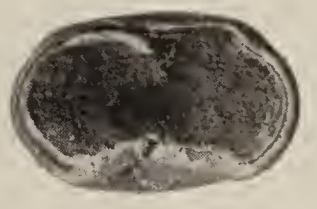

Fig. 9.
Geaster hygrometricus (section, unexpanded.)

Fig. 10.
Geaster hygrometricus (unexpanded, caespitose plants.)

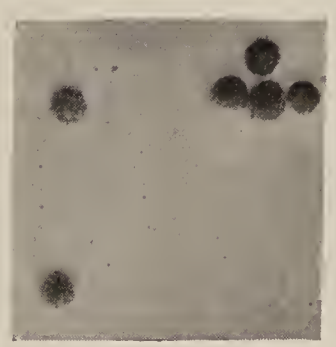

Fig. 11.
Geaster hygrometricus (spores magnified.)

but that this is exceptional, or usual, we do not know. The young plants are liable to be taken at first for a species of hypogaeal fungi, or on examination under a microscope for an undeveloped Scleroderma. The genus Diploderma was based on unopened specimens of this plant and Cycloderma on unopened specimens of other Geasters. The general resemblance of the spore glass to that of a Scleroderma is close, for the large rough spores are very similar, and the capillitium is so relatively scanty, that when a piece of gleba is pressed on a glass often only spores can be seen. The capillitium however can be readily floated out by method described in foot note on page 7 of "Gastromycetes Genera."

The plant ripens in late summer or fall of the year, and the thick outer peridium splits into segments, sometimes as few as four, sometimes as many as twenty. They are strongly hygroscopic and in moist weather recurve and standing on their tips lift up the inner ball. In

dry weather they closely curve in, clasping the ball, and they will repeat this as often as the conditions become moist or dry. Hence they are called "hygrometricus" and frequently by children "poor-man's weather-glass." Miss Marshall in St. Nicholas states that in the closed condition they are carried along by the wind and applies to them the name of "Fair weather travellers." Plants persist often during winter and one observing them in the spring expanding under the influence of moisture may take them for growing plants. They become "weather-worn," the inner surface of the exoperidium cracked in numerous areas, the surface of the inner peridium frayed and fibrillose. It is a weather-worn specimen that Schweinitz named "Geaster fibrillosus."

Geographical Distribution.

The plant is cosmopolitan. Common throughout Europe, it is more rare in England than on the continent. In this country it occurs from coast to coast and from Canada to Mexico. Locally however, it has never been found in the immediate vicinity of Cincinnati.

Specimens in our Collection.

Massachusetts, Miss Cora Clarke, Mrs. Chas. Cheney, Simon Davis, Walter Deane. *Connecticut*, James B. Rorer. *New York*, Ella K. Hays. *Pennsylvania*, Ellen M. Dallas. *Maryland*, C. L. Shear. *Minnesota*, Minn. Bot. Survey. *Tennessee*, S. F. Corly. *Georgia*, Roland M. Harper. *Florida*, Mrs. Delia Sams, H. C. Culbertson, P. H. Rolfs, C. G. Lloyd. *Colorado*, C. F. Baker. *Washington*, W. N. Suksdorf. *Illinois*, L. H. Watson.

France, N. Patouillard, F. Fautrey. *Tirol*, Rev. G. Bresadola. *Hungary*, Dr. L. Hollos.

Explanation of Figures.

Fig. 5. A plant of our collection from Walter Deane, Cambridge, Mass. Fig. 6. The same plant when moistened. Fig. 7. Photograph of plant in situ, by F. J. Braendle, Washington, D. C. Fig. 8. Unexpanded plant. Fig. 9. Section of same. Fig. 10. A cluster of unexpanded plants, from W. N. Suksdorf, Washington. Fig. 11. Spores magnified 450 diameters.

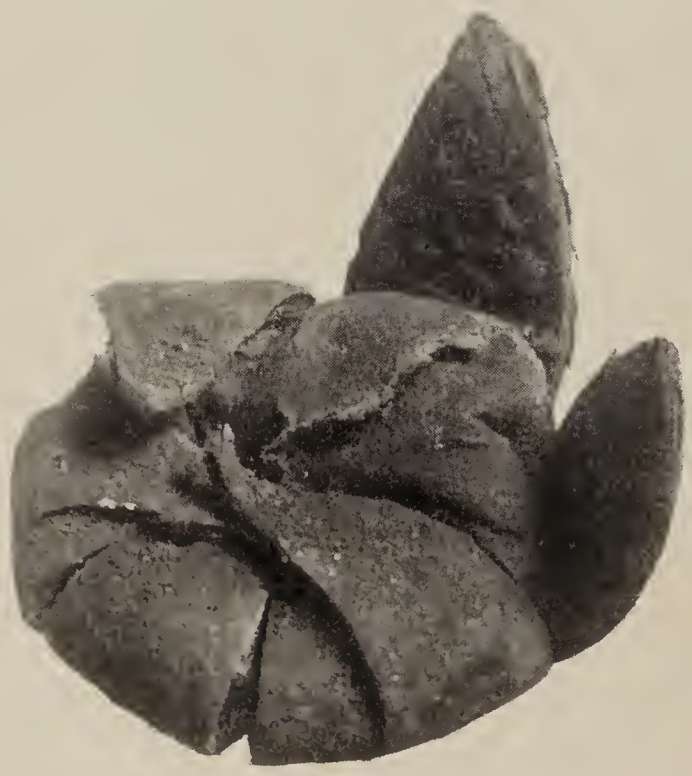

Fig. 12.
Geaster hygrometricus var. giganteus, (unexpanded)

GEASTER HYGROMETRICUS VAR. GIGANTEUS.

A large form, differing from the ordinary plant only as to size, frequently reaches us from the Western States. It is so much larger than the usual plant that we think is entitled to a distinctive name. This large plant does not grow in Europe to our knowledge.

Fig. 13.
Geaster hygrometricus var. giganteus (expanded.)

Specimens in our Collection.

California, L. A. Greata.
Washington, W. N. Suksdorf.
Iowa, T. H. McBride.

Explanation of Figures.

Fig. 12. Geaster hygrometricus var. giganteus, specimen, from L. A. Greata, Los Angeles, Cal.

Fig. 13. The same after expanding by moisture.

2—GEASTER DELICATUS.

Outer peridium thin, smooth, firm, hygroscopic, cut (about ⅔ deep) to 8–10 segments. Spreading when moist, incurved when dry. Inner peridium subglobose, opening by a plane, indefinite aperture. Columella none. Capillitium slender, interwóven, simple or sometimes slightly branched near the end, slightly thinner than the spores. Spores globose, minutely warted, 5–6 mc.

This elegant little species is known only from the Northwest. It was described by Prof. Morgan from specimens received from Nebraska. Hollos considers this plant a synonym of G. lageniformis of which he sends specimens. (*) It seems to me however that the plants while *very close* are different. Lageniformis has a protruding mouth. Delicatus the mouth is indefinite, plane, merely an aperture, the same as G. hygrometricus. We admit that the two plants are very close, probably the same, but for the present would keep them distinct. Had Morgan had access to Vittadini's figure we should not have blamed him for describing the plant he met as a new species. The figure is an

Fig. 14.
Geaster delicatus.

Fig. 15.
Geaster delicatus (unexpanded.)

(*) See Appendix.

elongated, oval plant with a protruding mouth. Delicatus is a depressed globose plant with no protruding mouth.

From G. mammosus which this plant closely resembles in general, having the same thin hygroscopic peridium, it can be distinguished by its mouth. From small specimens of G. hygrometricus with which it agrees as to its mouth, it can be at once distinguished by its thin peridium and small spores.

Specimens in our Collection.

Washington, W. N. Suksdorf. *Nebraska*, Chas. E. Bessey, (given us by A. P. Morgan).

Explanation of Figures.

Fig. 14. Geaster delicatus expanded. Fig. 15. Same unexpanded.
a—Specimen from Chas. E. Bessey, Nebraska.
b—Specimen from W. N. Suksdorf, Washington.

3—GEASTER DRUMMONDII.

Exoperidium rigid, hygroscopic, strongly incurved when dry, cut (about ⅔ deep) to usually ten linear segments. Mycelium and fleshy layers absent in all specimens I have seen. Inner peridium globose, smooth, firm, sessile, having a short, conical, strongly sulcate mouth, not seated on a definite area. Columella linear (?) (*). Capillitium simple, tapering, about thickness of spores in thickest part. Spores globose, rough, 5–7 mc.

a

b

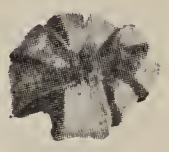

Fig. 18. Geaster Drummondii.

The little plant is apparently rare. I first received it under the name striatulus from Dr. Hollos, Hungary. Afterwards I found it in Ellis' Exs. (No. 110) in Washington, Philadelphia and New York, labeled mammosus, (cfr. Myc. Notes, p. 71, No. 162, where however, the reference to Ellis' exsiccatae is given in error as 109). Hollos who is familiar with this small plant in Hungary, has examined specimens of G. Drummondii of Berkeley from Australia, and pronounced it the same plant, only larger specimens. We really see no essential difference in Cooke's description (save size) of the two plants in "Australian Fungi", and we believe Berkeley's illustration in Hooker's Journal is this plant. We think there is no question but that Kalchbrenner had the plant in view in his description of striatulus, (Grev. vol. 9, p. 3,) though he gives a wrong synonym. Henning beautifully illustrates the little plant from South Africa under the name G. Schweinfurthii, (Eng. Bot. Jahrb. Vol. 14, t. 6, f. 7.)

(*) Very indistinct in specimens examined and not clearly made out.

Geographical Distribution.

Hungary, (Hollos). Australia, (Kalchbrenner). South Africa, (Henning). New Jersey, (Ellis).

Specimens in our Collection.

Hungary, Dr. Hollos.
Florida, Specimens from A. P. Morgan, (I am in some doubt as to these specimens, they are not so typically hygroscopic as all others I have seen.)

Explanation of Figures.

Fig. 18. Geaster Drummondii. a—Expanded. b—Unexpanded. Specimens from Dr. L. Hollos, Hungary.

4—GEASTER MAMMOSUS.

Exoperidium thin, rigid, hygroscopic, smooth, divided almost to base into about ten linear segments, often umbilicate at the base as shown in fig. 17b. Inner peridium globose, smooth, sessile, furnished

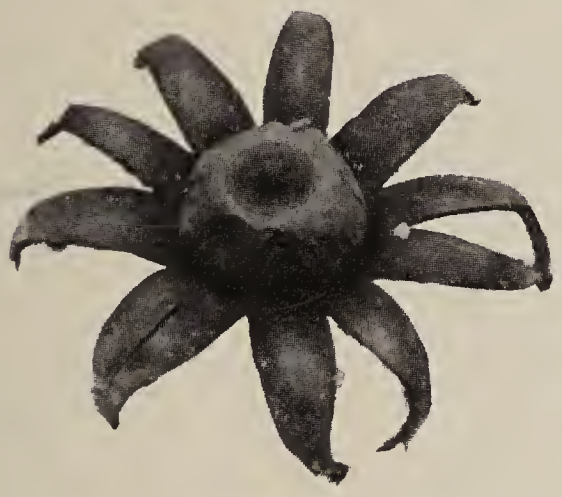

Fig. 16.
Geaster mammosus, (expanded.)

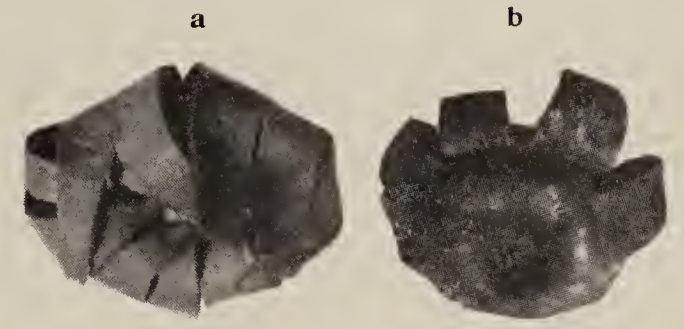

Fig. 17.
Geaster mammosus (unexpanded.)

with a conical, even, protruding mouth seated on a definite area. Columella short, globose, evident (though indistinct in mature plants). Capillitium simple, tapering, hyaline, often flattened, slightly thinner than the spores. Spores globose, roughened, 3–7 mc. (*)

This plant differs from other hygroscopic species by its *even* conical mouth. The plant was early (1809) beautifully illustrated by Sowerby (t. 401). Fries (1829) gave the name Geaster mammosus to some plant, but not to this, as he describes it as drying with the exoperidium reflexed, and refers Sowerby's characteristic plate, doubtfully, to Geaster hygrometricus. Chevallier (1836) clearly describes and characterizes its difference from hygrometricus by its mouth. He is usually (and justly in our opinion) cited as the author of the name. Vittadini (1843) gave a fine figure of the plant, but strangely in his text states that it is the Friesian interpretation of the plant and "not Chevallier."

(*) Morgan states 5–6 mc. We have specimens from Canada where the spores vary *in the same plant* from 3 to 7 mc. in diameter. Our English specimens run more uniform, 3 to 4 mc.

Geographical Distribution.

This plant is distributed through Europe and United States. (*)

Specimens in our Collection.

Canada, Wm. Dearness. *Minnesota*, Minn. Bot. Survey. *Iowa*, W. J. Teeters. *Pennsylvania*, Dr. Wm. Herbst. *California*, L. E. Benton, (specimen from A. P. Morgan).

England, Chas. Crossland. *Hungary*, Dr. L. Hollos.

Explanation of Figures.

Fig. 16. Geaster mammosus, expanded. Fig. 17. Same, unexpanded. Fig. 16 and 17b. Specimens from Chas. Crossland, England. Fig. 17a. From John Dearness, Canada.

SECTION 2.—NON-RIGIDAE.

This section is readily recognized from the previous by the segments of the exoperidium not drying strongly incurved over the endoperidium. Two species which we include in this section (Smithii and arenarius) have a strong tendency toward the previous section, but the tips only of the exoperidium segments dry incurved, not the entire exoperidium. We divide the section into two subsections.

Mouths sulcate (see following)
Mouths even, (see page 22.)

SPECIES WITH SULCATE MOUTHS.—NON-RIGIDAE.

Plants of this section are distinguished from the following section by the sulcate (not even) mouths. It is a question if the same plant under different conditions cannot have a mouth that varies, sulcate or even. If that is so then Geaster Morganii becomes G. lageniformis and Geaster arenarius becomes G. Smithii. We think while it is possible it is not proven, for our observation is that plants of the same collection have mouths either all sulcate, or all even.

Omitting from discussion at present G. Morganii (which differs in being truly sessile and usually saccate) and G. Smithii, (which is unique in itself,) there remains in this section G. pectinatus, G. Bryantii, G. Schmidelii and G. asper. These four plants no doubt should be truly considered as forms of one species, but as they never run into each other so closely that there is trouble in naming them, we think it better to present them as distinct species. At the same time they have been so confused in literature it is almost a hopeless task to straighten out the tangled threads. All have strongly sulcate beaked mouths, all pedicels either short or long, all exoperidia usually revolute. All are covered partly in the text and partly in citations of Fries "striatus" and no doubt that conglomerate species of Fries is responsible for the confusion that has since existed.

KEY TO THE SPECIES.

Mouth long beaked, pedicel slender, inner peridium usually striate beneath,	(5)	pectinatus.
Mouth long beaked; pedicel slender; inner peridium with a circular groove beneath,	(6)	Bryantii.
Mouth short beaked; pedicel short, thick; peridium neither striated nor grooved,	(7)	Schmidelii.
Mouth short beaked; inner peridium short pedicellate, asperate	(8)	asper.
Mouth conical, inner peridium sessile,	(9)	Morganii.
Mouth flattened conical, depressed,	(10)	Smithii.

(*) Notwithstanding Massee's statement "The North American specimens under this name are certainly not the true species."

5—GEASTER PECTINATUS.

Exoperidium revolute, cut about to the middle into 8 to 10 segments. Mycelial layer generally adnate, carrying with it soil. Fleshy layer thin, finally peeling off, and partly peeled off in most specimens giving them a ragged appearance. Pedicel slender. Inner peridium subglobose but somewhat tapering into the pedicel and marked with striae at the base, either faintly or strong enough to be called ridges. Mouth strongly sulcate, beaked, or slender conical. Capillitium slightly thicker than spores. Spores globose, rough, 5–6 mc. in diameter.

Fig. 19. Geaster pectinatus (large plant)

Fig. 20.
Geaster pectinatus.

Fig. 21.
Geaster pectinatus.

Fig. 22.
Geaster pectinatus (small plant.)

Schmidel (1747) gave four figures (t. 37, f. 11–14) excellently illustrating this plant Persoon (1801) called these figures Geaster pectinatus. Fries mixed it up with three other species under the name G. striatus and since Fries' day it has been so badly confused that we can only refer our readers to the references in appendix for details.

Hollos states that G. pectinatus is "a fungus of so rare occurrence it was quickly forgotten." It is undoubtedly a rare plant, we do not remember having seen a specimen in any of the Eastern collections, and yet we find we have five different gatherings, in our own collection. Miss Caroline A. Burgin of Philadelphia and Mrs. Delia Sams of Florida are the only collectors of the plant in this country to our knowledge.

Geographical Distribution.

Europe and the United States, rare in both countries.

Specimens in our Collection.

Pennsylvania, Miss Caroline A. Burgin. *Florida*, Mrs. Delia Sams.
Tirol, Rev. G. Bresadola. *France*, E. Boudier. *Sweden*, L. Romell.

Explanation of Figures.

Fig. 19. Large plant from L. Romell, Sweden. Figs. 20 and 21. Specimens from Caroline A. Burgin, Pennsylvania. Fig. 22. A small plant, specimen from Mrs. Delia Sams, Florida.

6—GEASTER BRYANTII.

Exoperidium similar to preceding species. Pedicel slender. Inner peridium subglobose, or somewhat abrupt at base, marked with a circular groove at the base. Mouths sulcate, beaked. Capillitium and spores as in the preceding.

Fig. 23. Geaster Bryantii

Fig. 24. Geaster Bryantii.

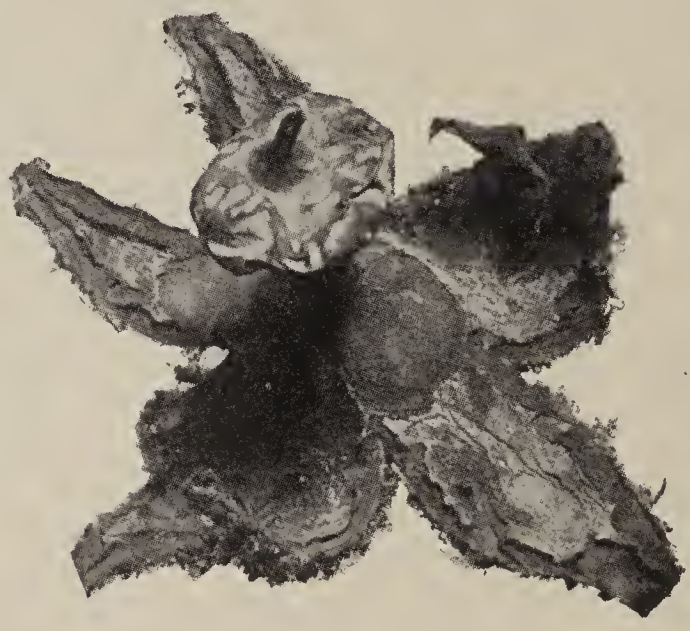

Fig. 25. Geaster Bryantii.

Fig. 26. Geaster Bryantii.

This plant is so close to the preceding that I am convinced it might more properly be considered a variety of it. Its distinctive feature the groove at base of peridium, is formed by the pedicel expanding to a disk shape top supporting the inner peridium, which being smaller where it is united forms a groove. It is the original of De Candolle's Geaster striatus, particularly as regarding his citations, but he does not mention in his text its distinctive feature, the circular groove. Hence there is a doubt whether he had this plant or the preceding. Fries, as previously stated, confused this plant with three others under the name Geaster striatus. Berkeley (Eng. Flo. p. 301) apparently drawing his conclusions from Fries, applied the name G. striatus to the preceding plant and renamed this G. Bryantii, citing the same references for it that De Candolle had cited for striatus with the addition of one citation, (Schmidel, t. 37, f. 11, 12). The last citation is an error, Berkeley having confused a ring shown on the pedicel of the cut, in reality a remnant of the fleshy layer, with the groove that this plant properly has. Berkeley's idea of a distinctive groove, the essential feature, is the first clear conception of the plant and we adopt his name, there never having been any confusion about it. The name Geaster striatus which priorists will no doubt use, is subject to the objection in our mind of not having been clearly defined in the first place, and having been applied since to *six different plants* by six different authors. Our specimens show another difference between this plant and pectinatus. The peridium is lead color, due to a kind of pruinose covering which may be rubbed off, and usually is on the exposed parts, giving the peridium a variegated appearance as shown in our photographs. (*)

Misconception as to the value of the fleshy layer is the source of at least two species based on this plant. Geaster orientalis (Grev. vol. 6, pl. 98, f. 12) is the plant with fleshy layer still remaining and forming "a tube in the shape of a ring at the base of the interior peridium." Geaster Kunzei (Winter in Rabenhorst's Flora) is the same plant, the fleshy layer having peeled off, hence "Stiel ohne basale Scheide." I judge from literature that the species is more common than pectinatus, yet it has reached me more rarely and fewer specimens.

Specimens in our Collection.

Maine, H. C. Beardslee. *Texas*, W. H. Long, (specimen from C. L. Shear.) *England*, E. M. Holmes, Chas. Crossland. *Sweden*, L. Romell.

Explanation of Figures.

Specimens from: Fig. 23, H. C. Beardslee, (from Maine). Fig. 24, L. Romell, Sweden. Fig. 25, Chas. Crossland, England. Fig. 26, E. M. Holmes, England.

(*) The student will note that this is exactly the reverse of statement made by Massee on same subject.

7—GEASTER SCHMIDELII.

Exoperidium revolute, cut to about the middle to usually five to seven segments. Mycelial layer usually adnate. Fleshy layer thin, usually adnate. Inner peridium with a short thick stipe or subsessile. Mouth conical, sulcate. Columella large, ovate. Spores small, globose, minutely roughened, 3½–5 mc.

a b c d

Fig. 27. Geaster Schmidelii.

This little plant is characterized by its small size, and short, thick pedicel. It is probably the plant covered in the text of Fries' Geaster striatus, but not his citations. It is the plant we think Chevallier intended to represent as G. minimus. (*) We have adopted the name used in the first illustration (Vittadini) that represents accurately this plant, though a large one, and although Vittadini's citations cover other species. The plant seems to be rare and has reached me but rarely.

Specimens in our Collection.

Tirol, Rev. G. Bresadola. *Hungary*, Dr. L. Hollos.

New Hampshire, C. E. Montgomery. (We have seen specimens also from *Vermont* in collection of A. E. Burt, and from *New Jersey* (unlabeled) in collection of N. Y. Bot. Gardens.

Explanation of Figures.

Specimens from: Fig. 27a, J. B. Ellis, New Jersey; b and c, C. E. Montgomery, New Hampshire; d, L. Hollos, Hungary.

8—GEASTER ASPER.

Exoperidium revolute, cut to about the middle to eight to ten segments. Both mycelial and fleshy layers are more closely adherent than in most species. Pedicel *short, thick.* Inner peridium subglobose, *verrucose.* Mouth conical, beaked, strongly sulcate, seated on a depressed zone. Columella prominent, persistent. Capillitium threads simple, long tapering. Spores globose, rough, 6 mc.

The character of this plant is the verrucose inner peridium. Under a glass of low power it appears as though the peridium was densely covered with grains of sharp sand. This plant alone has this character to our knowledge, and although it is indicated in the figures of G. coronatus of both Schaeffer and Schmidel, we think there it is an exaggeration of the very *minute* granular appearance coronatus has.

(*) Hollos refers this figure to Geaster asper.

Geaster asper is on the plate of the first Geasters figured (Michelius, 1729, pl. 100, f. 2), where the plant is characteristically shown, excepting the pedicel is more slender than normal. The word

Fig. 28. Geaster asper.

Fig. 29. Geaster asper.

Fig. 30. Geaster asper.

"asper" is the first descriptive adjective applied by Michelius. Fries included it in his complex striatus. It has been described as a new species in recent times by three authors; as G. campestris by Morgan (1887); as G. Berkeleyi by Massee (1889); and as G. pseudomammosus by Henning in 1900.

Specimens in our Collection.

Hungary, Dr. L. Hollos.
Kansas, E. Bartholomew. *Kentucky*, C. G. Lloyd. *Ohio*, A. P. Morgan, (type specimens of G. campestris).

Explanation of Figures.

Figs. 28, 29 and 30 (section). Specimens all from A. P. Morgan, Ohio, and the type of "G. campestris."

9—GEASTER MORGANII.

Young plant acute. Exoperidium cut beyond the middle to seven to nine *acute* segments. In herbarium specimens usually saccate but sometimes revolute. Mycelial layer closely adherent, compared to previous species relatively smooth. (*) Fleshy layer when dry, thin closely adherent. Endoperidium globose, *sessile*. Mouth sulcate, indefinite. Columella globose-clavate. Capillitium thicker than the spores. Spores small, globose, 4 mc, almost smooth.

This plant is common around Cincinnati and was referred by Morgan to "striatus." It is a reddish brown plant and differs widely from other species with sulcate mouths previously described in its

(*) As in the previous species the mycelium covers the young plant but is not so strongly developed so that the adhering dirt is not so evident on the mature plant.

closely sessile endoperidium. It is the same plant as lageniformis, indeed Bresadola so refers it, excepting that plant normally has an even mouth, and no other species to our knowledge has mouths in both the

Fig. 31. Geaster Morganii.

Fig. 32. Geaster Morganii.

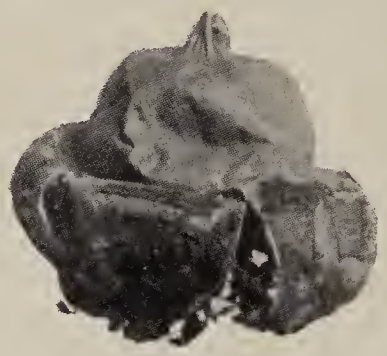

Fig. 33. Geaster Morganii

Fig. 34. Ceaster Morganii.

Fig. 35. Geaster Morganii. (A young plant.)

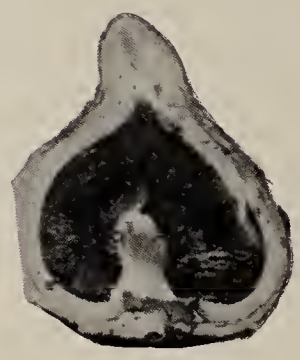

Fig. 36 Geaster Morganii. (Section of a young plant.)

even and the sulcate series. Still we are convinced of the strong probability of this view and have found in a collection of sulcate mouthed specimens *a single specimen with an even mouth.* It is quite common in this immediate vicinity growing about old stumps and logs, but has never reached me from any other locality in this country or from Europe.

Specimens in our Collection.

Ohio, Mr. Spurlock, W. H. Aiken, C. G. Lloyd.

Explanation of Figures.

Figs. 31, 32 and 33. Specimens from Mr. Spurlock. Figs. 34, 35 and 36. Collected by author; all from immediate vicinity of Cincinnati. Figs. 35 and 36 from fresh specimens, others from dried specimens.

10—GEASTER SMITHII.

Young plant globose. Exoperidium subhygroscopic, cut about half way to 8 to 12 segments, partly reflexed but tips of segments drying incurved. Mycelial layer thin, usually adnate, with adhering sand. Fleshy layer drying thin, adnate. Inner peridium subpedicellate, in reality almost sessile but the outer peridium drawing away from it. Mouth *flattened conical* (or when old conical) *seated on a depressed area, regularly sulcate–striate.* Color of spore mass blacker than in most Geasters. Threads about thickness of spores. Spores globose, rough, apiculate, 4–5 mc.

Fig. 37. Geaster Smithii.

This little plant is unique as to its mouth (well shown in our figures) from all other species. Morgan refers it to G. umbilicatus of Fries, and if we draw our conclusions only from what is published we should so refer it. Both Patouillard and Bresadola however, say "not umbilicatus" (*) and they are in better position to know than we are.

This plant was well described and figured by W. G. Smith (in Gard. Chron. 1873, p. 469) under the erroneous name of G. striatus. The figures have the mouth more protruding than our cut, but that is a condition of age. His figures show the same *depressed* area characteristic of the plant. He states "the striae of the mouth are so matchlessly perfect and beautiful that no art can do them justice." We believe however, our figure will give a good idea of them.

Being unable to call this plant umbilicatus (as did Morgan) or striatus (as did Smith) we have named it in honor of Worthington G. Smith, who has done better work with Geasters of England than any other mycologist.

Specimens in our Collection.

Florida, Mrs. Delia Sams.

Explanation of Figures.

Fig. 37. Specimens from Mrs. Delia Sams, Florida.

(*) "Not umbilicatus but a species unknown to me perhaps new."—Bresadola.

"Geaster umbilicatus of modern authors, but I am not certain that it is that species of Fries, and in any case it is *not* that of Montagne, neither of Léveillé "—Patouillard.

SPECIES WITH EVEN MOUTHS.—NON-RIGIDAE.

(See remarks on page 14 under head of "Species with sulcate mouths.")
The even-mouthed species can be divided into three subsections:
Exoperidium recurved (not fornicate), (see following).
Exoperidium fornicate,* (mostly quadrifid), (see p. 29).
Exoperidium saccate, sessile, (see p. 33).

EXOPERIDIUM RECURVED, (not fornicate.)
NON-RIGIDAE, MOUTH EVEN.

The mycelial layer in this subsection is often disposed to separate either entirely or partly adherent (particularly in limbatus and minimus) but is never truly fornicate as in the following subsection.

KEY TO THE SPECIES.

Large species,
  Unexpanded plant globose,
    reddish brown, sessile or pedunculate,.....(11) rufescens.
    black, pedunculate,.....(12) limbatus.
  Unexpanded plant acute, plant reddish brown, ...(13) triplex.
Small species,
  pedicellate, not hygroscopic, ...(14) minimus.
  subsessile, subhygroscopic,..... .... (15) arenarius.

11—GEASTER RUFESCENS

Unexpanded plant globose. Exoperidium recurved, cut to usually eight segments to about the middle. Mycelial layer, adnate with its adhering dirt or sometimes entirely peeled off. Fleshy layer mostly adnate, *thick*, porous, cracked and having the appearance of rough reddish leather. Inner peridium sessile or usually with a short thick pedicel, somewhat tapering toward the base. Mouth in-

Fig. 38. Geaster rufescens.

Fig. 39. Geaster rufescens.

(*) The word fornicate meaning arched, as applied to a Geaster means *arched over the cup shape mycelial layer.*

definite, fibrillose, frequently torn. (*) Columella large, thick, globose, permanent. Threads thicker than spores. Spores globose, roughened, varying from three to six mc.

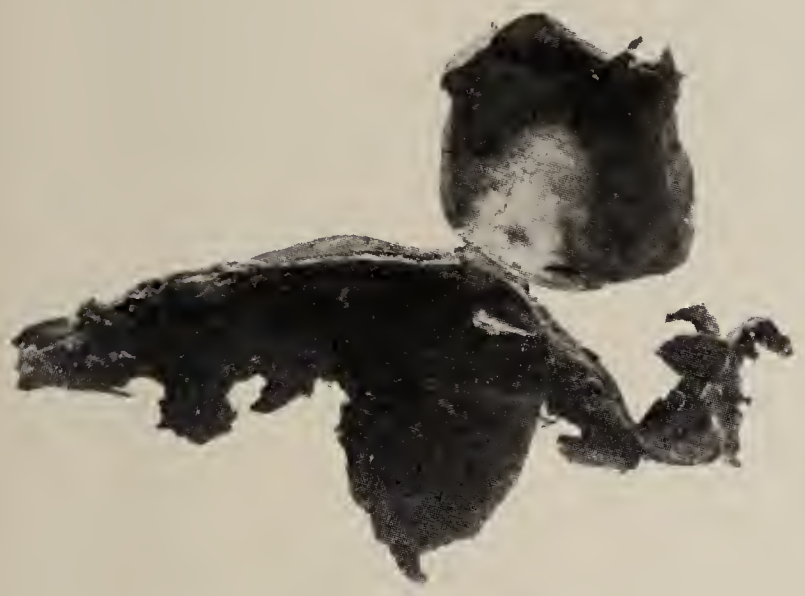

Fig. 40. Geaster rufescens (section).

Fig. 41. Geaster rufescens (unexpanded plant.)

This is the large reddish plant, the most frequent species we have in this country. It is sometimes sessile but usually has a short thick peduncle. The plant from the days of Persoon has been placed in the "sessile" section of the genus, hence when Morgan met the peduncled form he naturally referred it to limbatus. Rufescens is a reddish brown plant, limbatus is a black plant, otherwise they are very close, though limbatus has usually a longer peduncle and a different shaped inner peridium. Schaeffer's old figure of the plant shows a regularly toothed mouth and Fries no doubt basing his description largely on this figure, described it as having a toothed mouth. The mouth is often torn but no more frequently than any other species, and the idea that this species can be distinguished by its "dentate peristome" is entirely erroneous, and should be dropped from descriptions.

Specimens in our Collection.

Ohio, A. P. Morgan, (labeled limbatus), David L. James, Tom Bell, H. L. True, E. J. Arrick, Tom Lloyd, C. G. Lloyd. *New York*, Ida M. Hays. *Kentucky*, Sister Marie. *Canada*, John Dearness, (spec. tending toward limbatus.)

Sweden. L. Romell. *England*, Carleton Rea. *Hungary*, Dr. L. Hollos. *Tirol*, Rev. G. Bresadola.

Explanation of Figures.

Fig. 38. Specimens from A. P. Morgan, Ohio. Fig. 39. Specimens from David L. James, Ohio. Fig. 40. Section, showing large columella. Fig. 41. Unexpanded plant, specimen from Dr. H. L. True, Ohio.

12—GEASTER LIMBATUS.

Outer peridium recurved, cut to about the middle to eight to twelve segments. Mycelial layer usually adnate with its adhering dirt, often partially separate, and sometimes entirely peeled off. Fleshy layer drying firm, hard, and closely adnate. Inner peridium some-

(*) Hence often inaccurately described as "toothed."

Fig. 42. Geaster limbatus

Fig. 43. Geaster limbatus.

Fig. 44. Geaster limbatus.

Fig. 45. Geaster limbatus.

times globose rounded at the base (Fig. 42) but usually "slightly constricted and then swollen at the base." (Fig. 45). Pedicel usually distinct—cylindrical (Fig. 43) but sometimes very short and thick, (Fig. 45). Mouth indefinite, fibrillose. Columella indistinct (in ripe specimens at least). Threads thicker than spores. Spores globose, roughened, 4–5 mc.

Fig. 46. Geaster limbatus (section)

Geaster limbatus is very close to G. rufescens, a fact that seems to have been noted by only one author, Scherffel. (*) The writers who usually place G. rufescens in the "sessile" section do not realize that it is so close to limbatus that specimens occur that are hard to refer to either species. G. rufescens is a reddish brown plant. G. limbatus is a black plant but the color distinctions run into each other to an extent. We have never seen G. limbatus with the thick porous fleshy layer, usually found on rufescens, and we have never seen rufescens with the peculiar constricted inner peridium usually (not always) found on limbatus. We believe that the prominent, persistent columella of rufescens is the characteristic feature which distinguishes it from G. limbatus. Any one knowing only extreme forms of limbatus such as Fig. 42, from England, and Fig. 45, from Kansas, would be justified in calling them different plants, but our series of specimens shows all grades of connecting forms.

G. limbatus is a frequent plant in this country and in Europe.

Specimens in our Collection.

Kansas, E. Bartholomew. *Iowa*, T. H. McBride. *Wisconsin*, Steve C. Stuntz. *Massachusetts*, F. Le Roy Sargent.

England, Carleton Rea. *Tirol*, Rev. G. Bresadola. *Hungary*, Dr. L. Hollos.

Explanation of Figures.

Fig. 42. Specimen from Carleton Rea. England. Fig. 43. Specimen from Steve C. Stuntz, Wisconsin. Fig. 44. Specimen from Dr. L. Hollos, Hungary. Fig. 45. Specimen from E. Bartholomew, Kansas. Fig 46. Section showing indistinct columella.

13—GEASTER TRIPLEX.

Unexpanded plant acute. Exoperidium recurved (or when not fully expanded somewhat saccate at base), cut to the middle or usually two-thirds to five to eight segments. Mycelial layer adnate. Fleshy layer generally peeling off from the segments of the fibrillose layer but usually remaining partially free as a cup at base of inner peridium. Inner peridium subglobose, *closely sessile*. Mouth *definite*, fibrillose, broadly conical. Columella prominent, persistent, elongated (see Fig. 49). Threads thicker than spores. Spores globose, roughened, 3–6 mc.

(*) "Geaster limbatus steht dem G. rufescens ungemein nahe."

Geaster triplex is a reddish brown color the same as G. rufescens with which we think it has been much confused though in reality a very different plant. It is not recorded from England (to our knowledge) and we think English botanists have mistaken it for rufescens. As the early figures on which rufescens is based show neither of the characters by which that plant is distinguished from triplex, it is doubtful if the latter plant is not really the original rufescens. The two plants were confused evidently by all the early botanists. The character generally given to distinguish triplex, viz :—the remains of the fleshy layer forming a cup at base of inner peridium while usually present should be considered in the nature of an accidental feature and not an essential character of the plant. It is however, the feature from which the plant derives its name, viz :—triplex, three fold, three layers. The distinguishing features by which the plant can be known from rufescens are, the acute (not globose) young form, the definite mouth, and shape of the columella (see Figs 40 and 49.)

Fig. 47. Geaster triplex.

Fig. 48. Geaster triplex.
(Beginning to expand.)

Fig. 49. Geaster triplex.
(Section.)

Geaster triplex seems to be frequent both in this country and in Europe, though we have no specimens from Europe.

Specimens in our Collection.

Canada; J. Dearness. *Minnesota*, Minn. Bot. Survey. *Ohio*, A. P. Morgan. *Pennsylvania*, Caroline A. Burgin. *Massachusetts*, G. E. Morris. *Connecticut*, E. P. Ely.

Explanation of Figures.

Fig. 47. A typically expanded plant, showing the remains of the fleshy layer from which the plant received its name, specimen from A. P. Morgan, Ohio. Fig. 48. A fresh plant beginning to expand, specimen from E. P. Ely, Connecticut. Fig. 49. Section showing columella.

14—GEASTER MINIMUS.

Exoperidium recurved, cut to about the middle to eight to twelve segments. Mycelial layer usually adnate, usually shaggy with adhering fragments of leaves, etc., sometimes partly or entirely separating.

Fig. 50. Geaster minimus.

Fig. 51. Geaster minimus.

Fig. 52. Geaster minimus (section).

Fleshy layer closely adnate, very light color, usually smooth on the limb of the exoperidium but rimose on the segments. Pedicel short but distinct. Inner peridium subglobose or tapering to base, covered *with minute granules*, usually light colored, but sometimes almost black. Mouth definite, with well marked circular area. Columella slender. Threads slender, equal or thinner than the spores. Spores about 5 mc.

This little plant is the most common small species of Geaster we have in this country. It seems to be rarer in Europe where it is usually known as G. marginatus. Vittadini's cut accurately represents our plant and the identity of the European plant is well established. There is an earlier G. minimus of Chevallier but his figure is doubtful and even if it could be positively identified, it would not be advisable to replace the name so firmly established for the common American plant.

While the specimens in Schweinitz herbarium are normal, he described the plant as having a flattened base, "basi plano."

Morgan reconstructs a cut (Am. Nat. 1884, p. 967) based on this error.

Specimens in our Collection.

Florida, H. C. Culbertson, C. G. Lloyd. *Louisiana*, W. N. Clute. *North Carolina*, Hannah C. Anderson. *South Carolina*, P. H. Rolfs. *Ohio*, W. H. Aiken. *Pennsylvania*, Caroline A. Burgin, Dr. Wm. Herbst. *Michigan*, B. O. Longyear. *Iowa*, T. H. McBride. *Canada*, John Dearness.

France, E. Boudier. *Tirol*, Rev. G. Bresadola.

Explanation of Figures.

Fig. 50. Specimens from W. H. Aiken, Ohio. Fig. 51. Specimens from Dr. Wm. Herbst, Pennsylvania. Fig. 51. Section.

15—GEASTER ARENARIUS.

Exoperidium subhygroscopic, cut to five to ten segments; drying usually with segments incurved. Mycelial layer closely adnate with adhering sand. (*) Fleshy layer closely adnate, light color, not

Fig. 53. Geaster arenarius.

Fig. 54. Geaster arenarius.

rimose. Inner peridium subglobose, with a very short but distinct pedicel in some specimens, in others appearing sessile. Mouth even, conical, acute, definite and usually darker colored than remainder of inner peridium. Columella indistinct. Spores globose, rough, 3–4 mc.

This little plant which I collected Feb. 1895, in the sand at Jupiter, Florida, I have never succeeded in getting named. My correspondents have suggested "G. saccatus" and "G. floriformis," but I am sure it is neither of these. It is very close to minimus, differing in its shorter pedicel and more hygroscopic exoperidium. It is still closer to Smithii, excepting its mouth.

Specimens in our Collection.

Florida, H. C. Culbertson, C. G. Lloyd, (both from the sand at Jupiter, Florida.)

Explanation of Figures.

All specimens from Jupiter, Florida. The segments of the one closed are more strongly incurved than usual.

(*) One specimen alone we have with the mycelial layer peeled away except at the tips, showing its relation to the fornicate section.

EXOPERIDIUM FORNICATE.—NON-RIGIDAE, MOUTH EVEN.

The word fornicate means arched but as applied to a Geaster means *arched over the mycelial layer which separates and remains as a cup in the ground.* The first two species are thus strongly characterized, the third not to such a strong extent.

KEY TO SPECIES.

Mouth indeterminate, plant not rooting, ...(16) fornicatus.
Mouth indeterminate, plant strongly rooting,..... .....(17) radicans.
Mouth determinate, plant small,..... .....(18) coronatus.

16—GEASTER FORNICATUS.

Outer peridium strongly and typically fornicate, the mycelial layer forming a perfect cup at base of plant. Fibrillose layer arched above the cup, to which it is attached by the tips of the segments, cut into four (rarely five) long segments. Fleshy layer partly adherent. Inner peridium distinctly urn shape as shown in our figures (not globose as Massee depicts) tapering below into a short thick peduncle. Mouth indefinite. Columella. (*) Spores globose, almost smooth, 4 mc.

Fig. 55. Geaster fornicatus.

While the very early botanists (Persoon and Buxbaum) distinguished the plant from coronatus, as varieties of same plant, from the day when Fries made his confusing compilation (1829) up to last year, these two plants, so widely different (see figs. 56 and 61) that even the crude cuts are readily distinguished, have been confused by authors in general under the name "fornicatus." We have concluded to retain it (†) for this plant for two reasons. 1st, Hudson who first gave the name to a species of Geaster while confusing as to his citations, evidently knew only this plant, as evidence all tends to the fact that the other (coronatus) probably does *not occur in England.* Every English illustration, Bryant, Blackstone, Sowerby, Smith, Massee,) represents this plant It is the only one we have received from England and English botanists advise us it is the only one they know. 2nd, The idea of a "fornicate" species is so strongly connected with the genus Geaster that it should be perpetuated in nomenclature, and applied to the plant that typically represents the idea. This plant which grows only in deciduous woods is much rarer in continental Europe than coronatus that grows common in pine woods, hence the latter plant is the usual species that has been distributed in exsiccatae under the name "fornicatus" These two plants are so distinct that it is strange to us how they could ever have been considered

(*) We do not wish to mutilate by cutting the few specimens we have of this plant.
(†) This is a reversal of our decision last year (see Myc. Notes, p. 71).

varieties of the same plant much less confused under the same name. Fries not content by including in "fornicatus" two distinct species, further adds to the confusion by ascribing to it a sulcate mouth, a

Fig. 56 Geaster fornicatus.

character which neither plant has. We do not think that Geaster fornicatus has ever been found in this country, and Geaster coronatus but rarely. The specimen preserved in the Schweinitz herbarium is neither of these species. (*) We do not know what it is.

Specimens in our Collection.

Hungary, Dr. L. Hollos. *England*, Carleton Rea.

Explanation of Figures.

Fig. 55. Specimen from Dr. L. Hollos, Hungary.
Fig. 56. Specimen from Carleton Rea, England.

(*) We state (Myc Notes, p, 77) that this is probably radicans, but a re-examination since of the specimen convinces us that it is not.

17—GEASTER RADICANS

Exoperidium typically fornicate, the outer layer separating and remaining as cup at the base, not having mycelium except at the base where it is strongly developed in a cluster of root-like fibers. Fibrillose layer arched, cut to five (or usually four probably) segments. Fleshy layer thin, dark reddish, closely adherent. Inner peridium subglobose but tapering to the base Mouth indefinite. Spores globose, almost smooth, 4 mc.

Fig. 57. Geaster radicans.

This plant related to fornicatus, is strongly different in the basal mycelium, and in the cup having lobes. It enjoys the unique distinction of being the only American species that has never been claimed by any one to grow in Europe. The only specimens we have seen are Rav. exsic. No. 103, and in the collection of Division of Veg. Pathology of Washington, where it was labeled "fornicatus." It grew on "a cedar log in Florida," but the collector's name not preserved. All its recorded stations are Southern and we believe it does not grow in our Northern States.

Specimens in our Collection.

Florida, (Kindness of Mrs. Patterson from the Washington collection).

Explanation of Figures.

Fig. 57. Specimen as above.

18—GEASTER CORONATUS.

Exoperidium fornicate, the mycelial layer forming an imperfect cup to which the arched segments of the fibrillose layer are loosely attached at the tips. The cup is not perfect however, as in the two previous species, but the mycelium is so strongly developed that adhering dirt and pine-needles represent an irregular mass rather than a definite cup Segments of the arched fibrillose layer usually four, sometimes five, deeply cut, but relatively short as compared to the segments of fornicatus. Fleshy layer light colored, partially adherent or sometimes entirely peeled off. Inner peridium oblong, tapering to a short pedicel at the base and to an acute mouth at the apex, *covered with minute granular particles*. Mouth definite. Spores globose, roughened, 4 mc.

It is not necessary to repeat here what we have said under fornicatus in regard to the confusion of these two plants. This plant is much closer to the minimus than to fornicatus. Indeed, its inner pe-

Fig. 58. Geaster coronatus.

Fig. 59. Geaster coronatus.

Fig. 60. Geaster coronatus.

Fig. 61. Geaster coronatus.

ridium is the same as minimus and specimens, as often found in collections devoid of the mycelial layer, might be referred to minimus if attention were not directed to its fewer and deeper lobes of the exoperidium. There is really no name in use that we can apply to this plant free from all objections. Both coronatus used by Schaeffer and Scopoli and quadrifidus by Persoon, include two plants in the citations. We have adopted the earlier name of Schaeffer because it is quite appropriate, (the plant is not inaptly compared to a crown) and there is no question as to Schaeffer's figure being intended to represent this plant. This species is very common in continental Europe and fre-

quent in collections (usually under the name fornicatus). Romell writes me that it is the most common Geaster of Sweden and hence must have been known to Fries, though why he describes the mouth as "sulcate" is strange if he had observed the plant instead of Schaeffer's inaccurate figure. We have never seen but one collection of the plant from this country made by G. E. Morris, of Waltham, Mass

Specimens in our Collection.

Tirol, Rev. G. Bresadola. *Hungary*, Dr. L. Hollos. *France*, F. Fautrey. *Sweden*, L. Romell.

Massachusetts, G. E. Morris.

Explanation of Figures.

Fig. 58. Specimen from G. E. Morris, Massachusetts. Fig. 59. Specimen from F. Fautrey, France. Fig. 60. Specimen from Rev. G. Bresadola, Tirol. Fig. 61. Specimen from L. Romell, Sweden. The collar shown in this figure is an accidental remnant of the fleshy layer and might never occur in another specimen.

EXOPERIDIUM SACCATE.—MOUTH EVEN.

In all the previous species with even mouths the exoperidium when expanded is revolute away from the inner peridium, but in this subsection the base remains as a cup holding the inner peridium. We can readily conceive however, that this would not hold true in all cases, but it is the usual condition that we find in specimens. Fimbriatus of Europe while saccate in all our specimens is not put into the saccate section by Fries. Lageniformis while we have never seen specimens not saccate, we have of the closely related plant Morganii and conceive that if perfectly expanded this would become revolute (as Fig. 32). Velutinus and saccatus are however truly saccate species.

KEY TO SPECIES.

Unexpanded plant globose,
- Exoperidium splitting into two layers,
  - velutinate, ... (19) velutinus.
  - smooth, ... (20) fimbriatus.
- Exoperidium not separating, ... (21) saccatus.

Unexpanded plant acute, ... (22) lageniformis.

19—GEASTER VELUTINUS.

Unexpanded plants globose, sometimes slightly pointed at apex. *Mycelium basal.* Outer layer rigid, membranaceous, firm, light color in the American plant; dark, almost black in the Samoan. Surface covered with short, dense, appressed velumen in the American plant so short that to the eye the surface appears simply dull and rough, but its nature is readily seen under a glass of low power. In the Samoan plant the velumen is longer and plant appears to the eye as densely tomentose. The outer layer separates from the inner as the plant expands and in mature specimens is usually partly free. The thickness and texture of the two layers is about the same. Fleshy layer dark reddish brown when dry, a thin adnate layer. Inner peridium sessile, dark colored, subglobose with a broad base and pointed mouth. Mouth even, marked with a definite circular light-colored basal zone. Columella elongated, clavate. Spores globose, almost smooth, small, 2½–3½ mc.

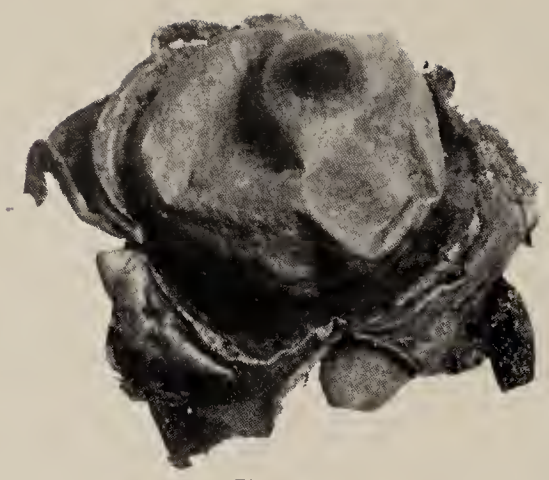

Fig. 62.

Fig. 63.

Fig. 64.

Fig. 65.

Fig. 69.

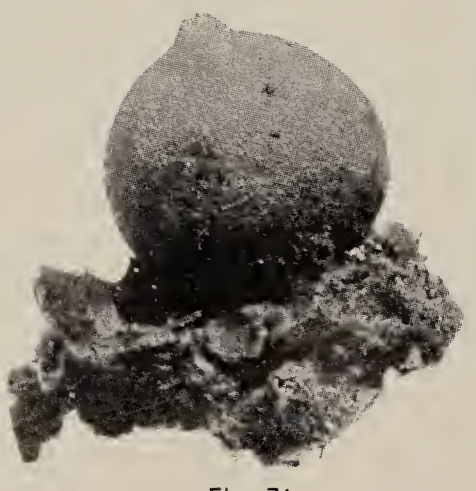

Fig. 71.

Fig. 68.

Fig. 70.

GEASTER VELUTINUS.

Explanation of Figures.

Figs. 62, 63 and 64. Expanded plant dried. Fig. 65. Just opening, showing the way two exoperidium layers separate. Figs. 66 and 67. Inner and outer view of a fresh expanded plant. Figs. 68, 69 and 71. Unexpanded plant. Fig. 70. Section of same.

Figs. 62, 63, 64 and 65. Specimens from Hugo Bilgram, Philadelphia. Figs. 66, 67 and 68. Photographs of fresh plants from Samoa. Figs. 69 and 70. From Cincinnati. Fig. 71. Specimen from A. P. Morgan and *type* of "Cycloderma Ohiensis."

This plant has a strange history. As far as we know it was first collected by Morgan in an unexpanded form and sent to Cooke,

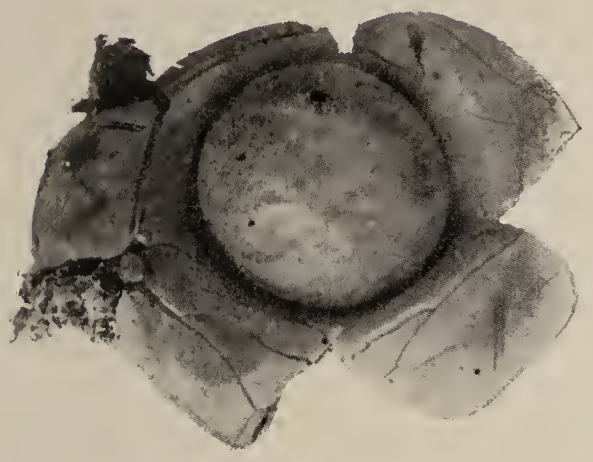

Fig. 66. Geaster velutinus.

Fig. 67. Geaster velutinus.

who hailed it with delight as a re-discovery of the long-lost genus "Cycloderma" (see Grevillea 1882, p. 95) and named it Cycloderma Ohiensis. We have "type specimens" of this plant given us by Morgan. We first collected it in the same condition and determined and distributed it as above. In 1898 Hugo Bilgram of Philadelphia, sent us a fine lot of a Geaster, new to us but mixed with a number of unexpanded specimens that we recognized as "Cycloderma Ohiensis." Comparison with "type" specimen leaves no question. When Morgan found the *expanded* plant he did not recognize the "Cycloderma Ohiensis" he had sent Cooke, but described as a new species Geaster velutinus. During a trip I made to Samoa (winter of 1899) I gathered a Geaster and sent it to Bresadola, which was described in Myc. Notes, p. 50, as "Geaster Lloydii." The plant was very dark colored, almost black, and densely velutinate, and the mouth is not definite, but a comparison of the specimens now with our American, leaves no doubt in my mind as to their being the same species. We are glad we are not priorists and therefore do not have to adopt the name "Geaster Ohiensis" for this plant, although we might write "Lloyd" after it; for "Ohiensis" was based on a mistake in the first place and is a local name not fitting to a plant that grows in Samoa.

Specimens in our Collection.

Canada, Wm. Dearness. *Pennsylvania*, Hugo Bilgram. *North Carolina*, H. C. Beardslee. *Ohio*, C. G. Lloyd, A. P. Morgan, (Type of Cycloderma Ohiensis) *Samoa*, C. G. Lloyd, (Type of Geaster Lloydii).

GEASTER VELUTINUS VAR. CAESPITOSUS,

A little plant growing densely caespitose, we collected and photographed at Crittenden, Ky. several years ago. We have lost our specimens but have no doubt it was but a small caespitose form of velutinus. The fresh plants were much darker color than the ordinary form, approximating in that respect the plants we collected in Samoa.

Fig. 72. Geaster velutinus var. caespitosus. (Unexpanded.)

Fig. 73. Geaster velutinus var. caespitosus. (Expanded.)

Explanation of Figures.

Figs. 72 and 73. From fresh plants, Kentucky.

20—GEASTER FIMBRIATUS.

Mycelium universal. Exoperidium cut to six to eight segments about half way, the limb shallow saccate. (*) Outer layer membranaceous, usually separating partially from the inner, the two layers

Fig. 74. Geaster fimbriatus.

being very similar as to texture and thickness as in the preceding plant. Fleshy layer when dry, thin, adnate. Inner peridium sessile globose, with an indeterminate fibrillose mouth. Spores globose, almost smooth, 4 mc.

(*) Fries who established the species did not describe it as saccate though if we can depend on the specimens we have, and the figure from Europe it belongs in this section.

This plant which I only know from European specimens I am convinced is practically the same plant as our saccatus. (*) With the exception of the indeterminate mouth, and the tendency of the exoperidium to split into two layers I can see no other difference. The idea that fimbriatus can be known by its "fimbriate" mouth is an error. The mouth does not differ from several other species with indeterminate mouths. The plant is recorded several times from this country, but I think determinations are based on saccatus.

Specimens in our Collection.

France, E. Boudier. *Hungary*, Dr. L. Hollos. *Tirol*, Rev. G. Bresadola.

Explanation of Figures.

Fig. 74a, c and d. Specimens from Dr. L. Hollos, Hungary.
Fig. 75b. From Rev. G. Bresadola, Tirol.

21—GEASTER SACCATUS.

Unexpanded plant globose. Mycelium universal. Exoperidium cut to six to twelve segments about half way, the limb deeply saccate. Mycelial layer adnate to fibrillose. Fleshy layer when dry, thin, adnate. Inner peridium sessile, globose, with a determinate fibrillose mouth. Spores globose, almost smooth, 4 mc.

a b c

Fig. 75. Geaster saccatus.

Although the plant differs in being more deeply saccate and having a determinate mouth, I believe it is only the American expression of G. fimbriatus of Europe. It is a very common little plant in this section, growing gregarious over rich soil and decaying leaves in woods. Geaster saccatus is a name given to a South American plant by Fries and applied to our species by apparently universal consent. I do not know however, that anyone really knows that it is Fries' plant. It certainly is not the plant that Spegazzini distributed from South America as saccatus.

Specimens in our Collection.

Florida, Mrs. Delia Sams. *Missouri*, N. M. Glatfelter. *Minnesota*, Minn. Bot. Survey. *Illinois*, L. H. Watson. *Ohio*, A. D. Selby, W. H. Aiken. *Kentucky*, C. G. Lloyd. *Pennsylvania*, Ellen M. Dallas. *Mexico*, E. W. D. Holway.

Explanation of Figures.

Fig. 75a. Expanded plant from fresh specimens. Fig. 74b. From dried specimens. Fig. 75c. Reverse view of expanded specimen. All from collection of author.

(*) Bresadola says not.

22—GEASTER LAGENIFORMIS.

Unexpanded plant acute, ovate, (compared to shape of a flask). Mycelium mostly basal. Exoperidium usually saccate. (*) Mycelial layer generally closely adnate, sometimes disposed to separate, often split into parallel lines. (†) Fleshy layer thin, usually peeling off from the segments but remaining on the limb of the exoperidium. Endoperidium subglobose, closely sessile. Mouth conical, definite. (‡) Columella elongated, in dried ripe specimens somewhat subglobose. Spores globose, rough, 5–6 mc.

Fig. 76. Geaster lageniformis. (Unexpanded, dried.)

Fig. 77.
Geaster lageniformis.

The entire plant is a reddish brown. Morgan (in conversation) suggests that it is a depauperate form of G. triplex, a view that is not improbable. The expanded plant can with difficulty be told from G. saccatus, though segments are more acute. The distinction is in the form of the unexpanded plant.

Specimens in our Collection.

Pennsylvania, Dr. Herbst. *Florida*, Mrs. Delia Sams. *Connecticut*, E. P. Ely. *Minnesota*, Minn. Bot. Survey. *Washington*, W. N. Suksdorf.
Germany, P. Magnus.

Explanation of Figures.

Fig. 76. Expanded plant from dried specimens in N. Y. Bot. Garden.
Fig. 77. Unexpanded plant from Minn. Bot. Survey; the shape is no doubt more abruptly acute than the fresh plant would be.

(*) In all our specimens and in Vittadini's figure. Smith (Gard. Chronicle 1873, p. 608) shows it recurved and it probably is so in fully expanded fresh plants.

(†) Mentioned by Morgan as G. vittatus.

(‡) In some specimens the entire mouth is lighter color than remainder of endoperidium, in other the mouth is dark but has a light color basal line.

APPENDIX 1.

REFERENCES.

These references are to plants and not to authorities for names of plants. They represent our views of the classification of *plants*. We do not present reference to the ownership or authority for names, as many authors do. Thus our citation under Geaster asper of "Geaster granulosus Cragin in Bull. Washburn" does not indicate that Cragin named a plant "Geaster granulosus." Whether he did, or did not, is of no possible interest to anyone save possibly to Mr. Cragin. The fact however, that he recorded a plant as "Geaster granulosus" which plant is G. asper is of interest to every student of Geasters and these facts alone we have endeavored to cite.

We give the names applied to plants since the adoption of the binomial system, and the fact that the *same name* has been applied to so many *different plants* by various authors we think should impress upon the student the importance of turning his attention to the study of plants, rather than the study of names. Previous to the adoption of the binomial system, we have cited no "names" as we consider the polyglot adjectives applied by the pre-Linnaean botanists in the nature of descriptions rather than names. We have given a few references on the authority of Rev. Bresadola (kindly communicated to us in letters), and some on the published work of Dr. Hollos.

Except when stated however, these references represent our views. We have cited very few references save where the plant is illustrated, or where we have seen specimens, for the citations of many authors are so conflicting that it is impossible to state what *plant* they have in view. Where an author gives an illustration of a plant that can be recognized, we accept that figure as representing the plant he had, though it may be in direct conflict to citations that he has made. We have given no bibliography in explanation of these references, and refer those interested to the excellent bibliography of the Gastromycetes given by Massee in Vol. 4 of Annals of Botany.

We feel and hope that most of our readers will study the plants that they meet, and that few will care to puzzle over these references. Those however, who study names of plants, or rather, who study misnames of plants, should be prepared to interpret these references without the aid of a "bibliography."

MYRIOSTOMA COLIFORMIS.

Doody in Ray. Syn. 2nd Ed. App. p. 340,—*Lycoperdon coliforme*, Dickson Fasc. 1, t. 3, f. 4, (good); Sowerby t. 313 (fine); *Geastrum coliforme*, Pers. Syn. p. 131,—*Geaster coliformis*. Smith in Gard. Chron. 1873, p. 469, f. 86; (Reproduced Grev. Vol. 2, t. 15, fig. 1); Massee Monog. Brit. Gast. fig. 66; Fischer in Eng. & Prantl. p. 321, fig. A.

GEASTER ASPER.

Michelius t. 100, f. 2 (more distinctly pedicellate but quite characteristic); Gleditsch Meth. t. 6, (copied from Michelius).—*Lycoperdon stellatum*. Purton Midland Flora Vol. 3, t. 20, (a splendid figure and rarely cited).—*Geaster asper*, Myc. Notes, No. 151; Hollos Term. Füzetek, (1902) p. 120; *Geaster Berkeleyi*, Massee Mon. Brit. Gast. t. 2, f. 41 (poor);—*Geaster campestris*, Morgan's Flora, p 14; Ellis N. A. F. Exs. No. 1940; Hollos "Kül. a Term. Köz." p. 23, f. 9;—*Geaster granulosus*, Cragin Washburn Bull., p. 40;—*Geaster pseudomammosus*, Henning Hedw. Vol. 39, p. 54, (teste Hollos);—*Geaster pseudostriatus*, Hollos Math. Term. Ert. (1901), p. 505, (Specimen examined, see Appendix p. 43).

GEASTER BRYANTII.

Geaster Bryantii, Berk. Eng. Flo. p. 300; Mass. Mong. Brit. Gast. t. 4, f. 56; Smith Gard. Chron. 1873, p. 505, f. 94; Reproduced Grev. Vol. 2, t. 16, f. 2.—*Geastrum coronatum var. Woodwardii*, Pers. Syn. p. 132.—*Geaster calyculatus*, Fuckel Symbolae, t. 5, f. 3; Zopff & Sydow Exs. No. 6; Rabenhorst Exs No. 2639.—*Geaster Bryantii form a fallax*, Scherffel Ber. Deut. Bot. Ges. 1896, t. 19, f. 3 (only);—*Geaster Rabenhorstii*, Haszl. Grev. Vol. 6, t. 98, f. 11.—*Geaster Kunzei*, Winter

Rab. Flora, p. 911.—*Geaster orientalis*, Haszl. Grev. Vol. 6, t. 98, f. 12.—*Geaster fornicatus var. multifidus*, Karsten (Spec. in N. Y. Bot. Garden).—Greville states "It is well figured in new series of Flora Londinensis." I have found no other references to this figure.

GEASTER CORONATUS.

Schmidel, t. 37, f. 1 and 2, (mouth not good in either, but both evidently this plant); Buxbaum, t. 28, f. 2, (teste Hollos); *Geaster quadrifidum var. minus.* Pers. Syn., p. 133;—*Lycoperdon coronatum*, Schaeffer, t. 183, (figure inaccurate but evident);—*Geaster fornicatus*, Thümen Myc. Univ. Exs. No. 526; Zopff & Sydow, Myc. Marc. Exs. No. 53; Kunze Exs. No. 11; Rabenhorst Exs. No. 2013b; Krieger Fungi Sax. Exs. No. 272; Roumeguere Exs. No. 3635; Winter's Rab. Flora, p. 896, f. 5; Hahn Pilzsammler, t. 29, f. 156; Myc. Notes, No. 153.—*Geastrum quadrifidum*, Pers. Comm., p. 75; Nees Pilze, t. 12, f 128. (copied from Schmidel);—*Geaster quadrifidus var. minor*, Hollos Term. Füzetek, 1902, p. 116. (*)

GEASTER DELICATUS.

Geaster delicatus, Morgan's Flora, p. 17; Ellis' N. A. F. Exs. 2nd Series, No. 1941.

GEASTER DRUMMONDII.

Geaster Drummondii, Berk. in Hooker's Journal, 1845, t. 1, f. 4.—*Geaster striatulus*, Kalch. Grev. Vol. 9, p. 3; Myc. Notes, No. 152.—*Geaster Schweinfurthii*, Eng. Bot. Jahrb. Vol. 14, t. 6, f. 7, (fine);—*Geaster mammosus*, Ellis N. A. F. Exs. No. 110.

GEASTER FIMBRIATUS.

Geaster fimbriatus, Fries' Syst., p 16 (exc. cit.); Smith Gard. Chron., 1873, p. 543, f. 104; Reproduced Grev. Vol. 2, t. 17, f. 2; Roumeguere Exs. No. 510 and No. 2317; Thümen Myc. Univ. Exs. No. 411; Kunze Fung. Exs. No. 8; Desmazieres' Exs. No. 956; Rabenhorst's Exs. No. 2010b.

GEASTER FORNICATUS.

Battarrea Fung. t. 39, (characteristic): Buxbaum t. 28, f. 1 (teste Hollos). *Lycoperdon fornicatum*, Huds. Fl. Eng., p. 644; Sowerby t. 198, (fine, but segments of exoperidium not relatively long enough); Bryant f. 14–17 (teste Hollos).—*Geaster fornicatus*, Massee Mon. Brit. Gast. t. 2, f 42, (subject to same criticism as Sowerby's figure); Smith Gard. Chron., 1873, p. 469, f. 87; Reproduced Grev. Vol. 2, t. 15, f. 2.—*Lycoperdon fenestratum*, Batsch Elen. t. 29, f. 168 a. b. (teste Hollos).—*Geaster fenestratus*, Myc. Notes, No. 150.—*Geastrum quadrifidum var. fenestratum*, Pers. Syn., p. 133.—*Geaster quadrifidus var. major*, Hollos Term. Füzetek (1902) p. 116. (*)—*Geaster Marchicus*, Fischer in Eng. & Prantl, p. 321, fig. B.—*Pleostoma fornicatum*, Corda Icon. Vol. 5, t. 4, f. 43.—*Geaster MacOwani*, Kalch, in Grev. Vol. 10, p. 108.

GEASTER HYGROMETRICUS.

Schmidel t. 28; Michelius t. 100, f. 4, 5 and 6, (the last the best); Gleditsch Meth. t. 6, (copied from Michelius).—*Geastrum hygrometricum*, Pers. Syn. p. 135; Schweinitz Fung. Car. No. 329; Nees Pilze t. 12, f. 127, (copied from Schmidel).—*Geaster hygrometricus*, Fries Syst. p. 19; Smith Gard. Chron. 1873, p. 577, t. 112; Reproduced Grev. t. 13. f. 2; Trelease Trans. Wis. Acad. Vol. 7, t. 7, f. 1, (poor); Winter Rab. Flora, p. 895, f. 1–3;—*Geaster vulgaris*, Corda Icones, Vol. 5, t. 4, f. 42;—*Astraeus stellatus*, Fischer in Eng. & Prantl, p. 341, fig. A, B and C;—*Astraeus hygrometricus*, Morgan's Flora, p. 19;—*Geastrum fibrillosum*, Schweinitz Syn. Car. No. 330, (we have examined the specimen and it is unquestionably an o'd weather-worn specimen of hygrometricus).

(*) The names adopted by Hollos seem very strange in view of the statement in the text "These two fungi are *no varieties* but are two different, independent species."

GEASTER LAGENIFORMIS.

Boccone Mus. t. 301, f. 6; (section of young plant);—*Geaster lageniformis*, Vitt. Monog. Lyc. t. 1, f 2; Myc. Notes, No. 167;—*Geaster saccatus*, Morgan's Flora, p. 18 (exc. of illustration); Smith, Gard Chron. 1873, p. 1275, f. 266; Reproduced Grev. Vol. 2, t. 20, (We think the plant Smith took for lageniformis fig. 116, is a form of the plant but not so typically as the plant he called saccatus); Trelease Trans. Wis. Acad. Vol. 7, t. 7, f. 2.—*Geaster minutus*, Henning Hedw. Vol. 39, p. 54 (teste Hollos).

GEASTER LIMBATUS.

Schmidel t. 46, (mouths too strongly defined); Ray Syn. 3rd Ed. t 1, (poor);—*Lycoperdon stellatum*, Sowerby t. 312, (good); *Geaster limbatus*, Fries Syst. p. 15; Hussey Brit. Myc. t. 2, (splendid and shows both slender and thick peduncled forms); Zopff & Sydow Exs. No. 103; Myc. Notes, No. 154.—*Geastrum coronatum*, Pers. Syn. p. 132;—*Geastrum multifidum var. B*—"Pers. Disp. meth. p. 6"—*Geaster pseudolimbatus*, Hollos Math. Term. Ert. 1901, p. 507, (specimens examined, see Appendix p. 43).

GEASTER MAMMOSUS.

Michelius t. 100, f. 3;—*Geaster mammosus*, Chevallier Flo. Paris, p. 359; Morgan's Flora, p. 16; Smith Gard. Chron. 1873, p. 543, f. 105; Reproduced Grev. Vol. 2, t. 19, f. 1; Vitt. Monog. Lyc. t. 1, f. 9, (fine);—*Lycoperdon recolligens*, Sowerby, t. 401, (fine).—*Geaster hygrometricus*, Massee, Monog. Brit. Gast. t. 4, f. 70, (His text of hygrometricus is correct but his figure is that of mammosus);—*Geastrum hygrometricum var. anglicum*, Pers. Syn. p. 135.

GEASTER MINIMUS.

Geastrum minimum, Schweinitz Fung. Car. No. 327, (confirmed by examination of his specimen).—*Geaster minimus*, Fries' Syst. p. 16; Morgan's Flora, p. 15; Ravenel Car. Exs. No. 74; Ravenel Amer. Exs. No. 472; Ellis N. A. F. Exs. No. 109; Roumeguere Exs No. 4549; Thümen Myc. Univ. Exs. No. 13; Myc. Notes, No. 146.—*Geaster marginatus*, Vitt. Monog. Lyc. t. 1, f. 6, (a small but correct figure of the plant);—*Geaster granulosus*, Fuckel (teste Bresadola), "I have just examined original specimens of G. granulosus Fuck. and it is G. marginatus 'tout á fait.' –"Bresadola.—*Geaster Schmidelii*, Roumeguere Exs. No. 3828.—*Geaster Queletii*. Hazsl. (teste Bresadola in letter.)—*Geaster Cesatii*, Rabenhorst (teste Bresadola in letter.)

GEASTER MORGANII.

Geaster Morganii. Myc. Notes, No. 168.—*Geaster striatus*, Morgan's Flora, p. 17; Ellis' N. A. F. 2nd series, No. 2736.—*Geaster saccatus*, Morgan's Flora, Plate 1, f. C.

GEASTER PECTINATUS.

Schmidel t. 37, figs. 11, 12, 13, 14, (the "rings" shown in fig. 11 has caused this figure to be referred, (erroneously) to Bryantii);—*Geastrum pectinatum*, Pers. Syn., p. 132;—*Geastrum multifidum var. a*, "Pers. Disp. Meth. p. 6."—*Geaster limbatus*, Smith Gard. Chron. 1873, p. 504, f. 95; Reproduced Grev. Vol. 2, t. 17, f. 1.—*Geaster Schmidelii*, Massee Mon. Brit. Gast. t. 4, f. 74; Winter Rab. Flora, p. 910;—*Geaster Bryantii forma fallax*, Scherffel Ber. Deut. Bot. Ges. 1896, t. 19, f. 1, 2 and 4, (not 3); *Geaster tenuipes*, Myc. Notes, No. 155.

GEASTER RADICANS.

Geaster radicans, Ravenel Exs No. 103; Myc. Notes, No. 159.

GEASTER RUFESCENS.

Schmidel t. 43 (mycelial layer inaccurately shown; the "dentate" mouths of this figure are responsible for this erroneous idea in connection with the species). Schmidel t. 43 (cont. on t. 50).—*Geastrum rufescens*, "Pers. Disp. meth.

p. 6''; Pers. Comm. p. 74; Pers. Syst. p. 134; Schweinitz' Fung. Car. No. 328, (the specimen in his collection is typical but sessile).--*Geaster rufescens*, Fries' Syst. p. 18; Smith Gard. Chron. 1873, p. 577, f. 111, (Reproduced Grev. Vol. 2, t. 19, f. 2).--*Lycoperdon recolligens*, Sowerby t. 80, (Usually here referred but I think more probably fimbriatus).—*Lycoperdon stellatum*, Sowerby in index to same figure; Schaeffer t. 182, (mouth very poor).—*Lycoperdon sessile*, Sowerby in text under t. 401, (referring to fig. t. 80).—*Geaster multifidum*, Grev. Flo. t. 306, (the expanded plant has the fleshy layer gone and endoperidium distinctly peduncled, the unexpanded plant is *globose*).—*Geaster limbatus*, Morgan's Flora, p. 15, plate 1, f. B.; Ellis' N. A. F. Exs. No. 1309.—*Geaster mammosus*, Rabenhorst's Exs. No. 814.—*Geaster Schaefferi*, Vitt. Monog. Lyc. t. 1, f. 1, (a small plant).

GEASTER SACCATUS.

Geaster saccatus, Ellis & Ev. Fung. Col. Exs. No. 1217; Myc. Notes, No. 162.—*Geaster lageniformis*, Morgan's Flora, p. 19.—*Geaster capensis*, Thümen Myc. Univ. Exc. No. 715; Roumeguere Exs. No. 4548.

GEASTER SCHMIDELII.

Geaster Schmidelii, Vitt. Monog. Lyc. t. 1, f. 7.—*Geaster Rabenhorstii*, Trelease Trans. Wis. Acad. Vol 7, t. 7, f. 3; Kunze Exs No. 10; Rabenhorst Exs. No. 2011; Zopff & Sydow Exs. No. 7.—*Geaster striatus*, Peck's 38th Rep. p. 94, (teste Trelease).

GEASTER SMITHII.

Geaster striatus, Smith Gard. Chron. 1873, p. 469, f. 88. (Reproduced Grev. Vol. 2, t. 16, f. 1.)—*Geaster umbilicatus*, Morgan's Flora, p. 16, (exc. reference to Ellis' Exc).

GEASTER TRIPLEX.

Michelius t. 100, f. 1, (Fries refers this to fimbriatus, Smith to Micheliianus).--*Geaster triplex*, Morgan's Flora, p. 18; Ellis N. A. F. Exs. No. 2735; Thümen Exs. No. 1410.—*Geaster cryptorhynchus*, Hazslinszky Grev. Vol. 3, p. 162, t. 47.--*Geaster Pellotii*, Rose (teste Bresadola).—"*Geaster stellatus Linn.*" Morgan in Jour. of Mycology, Vol. 8, p. 4. (*)

GEASTER VELUTINUS.

Geaster velutinus, Journ. Cin. Soc. Nat. Hist. Vol 18, p. 38; Cycloderma Ohiensis Grev. Vol. 11, p. 95.—*Geaster Lloydii*, Myc. Notes, No. 117.

(*) Linnaeus' idea of "Lycoperdon stellatum" was simply the genus Geaster as we now know it. He did not know any *species* of Geasters and referred to "Lycoperdon stellatum" every figure of a Geaster he found, some half dozen different species. It is absurd in our mind to attempt to replace an established name of a species of Geaster on the ***authority of Linnaeus***, a man who had no idea of *any species* of Geaster. Michelius who wrote many years before Linnaeus, had definite ideas of a few Geasters, but Linnaeus did not know enough of the subject to avail himself of the work of Michelius. Linnaeus apparently was not acquainted with the work of Schmidel, a pre-Linnaean botanist, who well illustrated several species.

APPENDIX 2.

SPECIMENS FROM DR. HOLLOS.

Since most of this pamphlet has been in type we have received from Dr. Hollos, Hungary, three specimens of Geasters.

Fig. 78.

Fig. 78, a little plant which Dr. Hollos sends as G. floriformis of Vittadini and considers same as G. delicatus of Morgan. We consider both of these views probable but neither proven. If it is G. delicatus then our idea of mouth of G. delicatus is wrong, for Hollos' specimen has a distinct and protruding mouth as shown in our figure, and we have always supposed G. delicatus to have a mouth not protruding, being merely an aperture. It is possible that these views, drawn from all specimens we have seen are wrong and that the mouth of G. delicatus *when perfect is protruding* as shown in fig. 78. In two of Hollos' specimens the mouths were worn off and the specimens could well be taken for G. delicatus. Let us hope that Messrs. Bessey, Piper, and Suksdorf who collect this plant will notice this point particularly during the present season.

As to the plants being G. floriformis, they do not agree with Vittadini's figure in two particulars. They are depressed globose; Vittadini shows an elongated plant. Their mycelium is evidently universal; Vittadini shows the mycelium *basal*, though this to our mind is probably erroneous as we *doubt if any of the rigidae have basal mycelium.*

Fig. 79. Geaster pseudostriatus.

Fig. 80. Geaster pseudolimbatus.

Fig. 79 a plant that Dr. Hollos has recently described as a "new species," G. pseudostriatus. To our mind it is G. asper and differs but little from the form we have in this country. The longer peduncle, we consider only a condition, not an essential character.

Fig. 80 a plant that Dr. Hollos has recently described as G. pseudolimbatus. We should call it G. limbatus.

.....INDEX.....

THE

LYCOPERDACEAE

.....OF.....

Australia, New Zealand

—AND—

Neighboring Islands.

ILLUSTRATED WITH 15 PLATES
AND 49 FIGURES.

By C G. LLOYD.

CINCINNATI, OHIO. APRIL, 1905.

Issued at The Lloyd Library.

INTRODUCTORY.

Australia is the richest country in the world in Lycoperdaceae, and more strange and endemic genera are found there than in any other continent. Our knowledge of the subject is based on relatively scanty material. Probably not more than a hundred specimens have reached the museums of Europe and most of these are at Kew. A majority of the species are known only from a single collection. I do not feel that the knowledge we have of the subject is more than introductory. The work that has been done with the Lycoperdaceae of Australia is mostly sporadic, scattered descriptions of supposedly "new species" by authors who desire to attach their names to them. The only systematic work is in Cooke's Handbook of Australian Fungi, which is a very complete compilation of this sporadic work. The author of this pamphlet has spent fourteen months in the museums of Europe in a systematic study of all the material to be found there, and he has been enabled to study practically all the type specimens on which descriptions of Australian species have been based. In addition we have solicited our correspondents to send us specimens and desire to acknowledge our indebtedness to the following who have kindly forwarded specimens:

MISS JESSIE DUNN, Wellington, N. Z.
F. M. READER, Warracknabeal, Victoria.
J. T. PAUL, Grantville, Victoria.
W. R. GUILFOYLE, Melbourne.
ROBERT BROWN, Christ Church, N. Z.
R. T. BAKER, Sydney, Australia.
J. G. O. TEPPER, Norwood, S. Australia.
ROBERT M. LAING, Christ Church, N. Z.
J. S. TENNANT, Ashburton, N. Z.
WALTER GILL, Adelaide, Australia.
W. W. WATTS, Sydney, Australia.

We are also advised of a shipment from **D. McALPINE, Melbourne,** sent to our Paris address (107 Boulevard St. Michel) but at the time this pamphlet was written the package had not reached us. Specimens received are acknowledged in detail under the species to which they belong.

CORRECTIONS.

The plates and the first form were printed in the absence from home of the author. Several mistakes have occurred.

Secotium melanocephalum page 7, correct to melanosporum.
Phellorina Delastrei page 10, correct to Delestrei.
Scleroderma verrncosum, Plate 31, correct to verrucosum.
Castoreum radicatus, Plate 38, correct to radicatum.
Scleroderma aurantiacum, Plate 31, correct to aurantium.

C. G. LLOYD,

Paris Address:

107 Boulevard St. Michel, = = Paris, France.

THE GASTROMYCETES.

a b

Fig. 1.

a—A basidium, bearing spores.
b—An ascus, containing spores.

Fungi, the larger fungi, are divided into two classes, 1st, the Basidiomycetes, which have the spores borne free on a basidia; 2nd, the Ascomycetes, which have the spores borne in a sack called the ascus. In this pamphlet we have to deal only with part of the first class.

The Basidiomycetes can in turn be divided into two very natural classes, 1st, the Hymenomycetes, those that have the spores exposed and free from the beginning, or at least from a very early state; 2nd, the Gastromycetes, those that develop the spores in cavities or chambers within the tissue of the plant.

It should not be inferred from the above that in order to recognize the Gastromycetes it is necessary to study the nature of the basidia, or to make other minute anatomical examination. As a matter of fact, the merest tyro soon learns to recognize on sight the various phalloids, bird-nest fungi, and various kinds of "puff balls" constituting the Gastromycetes and they were well classified before their anatomical structures were known.*

CLASSIFICATION.

Gastromycetes can be readily divided into four families widely differing from each other as to the nature of the mature plants.

FAM. 1.—PHALLOIDEAE.—PHALLOIDS. Plant fleshy, enclosed in a gelatinous volva when young. The gleba deliquescing and becoming a mucilaginous (generally foetid) mass.

Phalloids are noted for the foetid odor that they have and for their bizarre shapes. They force themselves to the attention of the most unobserving and are often called such appropriate names as Stink Fungus, Stink Horns, Dead Men's Fingers. Australia is particularly rich in these bizarre plants.

FAM. 2.—NIDULARIACEAE.—NEST FUNGI. Plants shaped like little cups, opening at the top, and containing a number of little seed-like bodies (peridioles). They look something like little birds' nests and are often called "Birds-nest fungi."

FAM. 3.—HYMENOGASTRACEAE.—HYPOGEAL FUNGI. Peridium indehiscent; gleba cavities permanent, not resolved into a mass of spores; capillitium absent.

This family is mostly subterranean like the true tubers or truffles. The Australian species are little known.

FAM. 4. LYCOPERDACEAE.—PUFF BALLS.—Ripe peridium enclosing a mass of dry spores, often mixed with capillitium. Sometimes the gleba walls persist forming peridioles, but in those cases the peridioles are filled with a mass of dry powdery spores.

The largest and most frequent tribe of Gastromycetes and embracing all the families known as "puff balls."

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* We have issued a pamphlet entitled "The Genera of Gastromycetes" in which the various terms employed in the description of these plants are explained. A copy will be mailed on application to The Lloyd Library, Cincinnati, Ohio, U. S. A.

Australian Genera of Lycoperdaceae.

It is not in the province of this pamphlet to consider the first three families of the Gastromycetes, and the following key embraces only the Lycoperdaceae.

TRIBE 1.—PODAXINEAE.—Plant stalked. Stalk continuous to the apex forming an axis.

Gleba a mass of spores and capillitium surrounding the axis, ... PODAXON.

Gleba of permanent cells, not resolved into a mass of spores,

Peridium wanting . . GYMNOGLOSSUM.

Peridium dehiscing by breaking away at the base, ... SECOTIUM.

Dehiscence of peridium unknown . . . . CLAVOGASTER.

TRIBE 2.—TYLOSTOMEAE.—Plant stalked. Stalk distinct from the peridium, or not continuous as an axis to the apex.

Peridium opening by an apical mouth,

Stipe inserted into a "socket" at the base of the peridium . . . . . TYLOSTOMA.

Peridium seated on the dilated apex of the stalk, ... CHLAMYDOPUS.

Peridium dehiscing by an irregular opening,

Peridium continuous with the stipe . . . PHELLORINA.

Peridium opening circumscissally . . . . . BATTARREA.

TRIBE 3.—SCLERODERMEAE. Gleba of globose rough spores mixed with fragments of the hyphae tissue. Capillitium none.

Walls of the gleba cells persistent, forming peridioles . . . . . POLYSACCUM.

Walls of the gleba cells mostly disappearing, or only partly persistent . . . . . SCLERODERMA.

TRIBE 4.—LYCOPERDEAE.—Plant not stalked. Spore mass dry spores mixed with capillitium.

TRIBAL ALLIANCE 1.—GEASTRAE.—EARTH STARS.—Peridium double, outer peridium thick, persistent, splitting into segments and recurving . . . . . GEASTER.

TRIBAL ALLIANCE 2.—BOVISTAE,—TUMBLERS.—Outer peridium thin. Inner peridium firm or cartilaginous. Mature plant loosened from place of growth.

Peridium cartilaginous. Capillitium of separate threads with slender pointed branches . . . BOVISTA.

Peridium thick. Capillitium of separate threads bearing spiny points . . . MYCENASTRUM.

Peridium firm. Capillitium threads mostly simple, short, unbranched with blunt ends . . . . . CATASTOMA.

TRIBAL ALLIANCE 3.—LYCOPERDAE.—TRUE PUFF BALLS.—Peridium flaccid. Plant normally attached to place of growth.

Peridium opening by a definite mouth,

Spores pedicellate . . . . . BOVISTELLA.

Spores without permanent pedicels . . . . LYCOPERDON.

Peridium rupturing irregularly and falling away in pieces, ... CALVATIA.

TRIBE 5.—ANOMALAE.—Not allied to the previous tribes or to each other.

Gleba of permanent cells, forming a thin layer adhering to the peridium . . . . . GALLACEA.

Peridium double. Spores fusiform subhyaline . . CASTOREUM.

Gleba composed of separate peridioles containing the spores . . . . . ARACHNION.

Gleba surrounding a hard central core. . . . MESOPHELLIA.

Young plant enclosed in a gelatinous volva . MITREMYCES.

Australian Species of Lycoperdaceae.

THE GENUS PODAXON.

Stalked plants, the stem continuous to the apex of the plant forming an axis for the gleba. Peridium usually cylindrical, dehiscing by breaking away at the base. Gleba a mass of spores and capillitium surrounding the axis.

The genus Podaxon grows only in hot sandy countries and is most abundant in Africa though known from every continent except Europe. In the United States it occurs only in the arid regions of the West. Many species of Podaxon have been described but are better referred to as descriptions of separate collections than of species. The characters are based on the color of the gleba, size and shape of spores, and abundance or scantiness of capillitium, but all of these characters vary in the same species I think.

PODAXON AEGYPTIACUS (Plate 25, fig. 1, 2 & 3).—Pileus short cylindrical 3 to 5 cm. long. Gleba very dark, almost black, but with a reddish tinge. Capillitium abundant deeply colored. Spores dark color, subglobose or ovoid, 10–12 mic.

This little plant, the smallest of the species, was first described from North Africa. Its occurrence in Australia is based on some specimens received from R. T. Baker, Sydney, collected by R. H. Cambage at Bourke.*

PODAXON MUELLERI (Plate 25, fig. 4 & 5).—Plant about 20 cm. high. Gleba light olive color. Capillitium abundant, cobwebby, almost hyaline. Spores olive.

* At Kew there is a poor specimen, from "Sutton River" on which the record of "Podaxon Indica" in Cooke's Handbook is based. Podaxon Indica is a very bad name and has no excuse to exist, not even priority. Linnaeus called a plant from India Lycoperdon pistillaris and the plant is now in his herbarium. Fries designated the Linnaean plant as Podaxon pistillaris, to which genus it belongs. Sprengle compiled it and changed the name arbitrarily to Mitremyces indicum. It has no relation to the genus Mitremyces and there was no reason to change the specific name. Most authors have used the specific name pistillaris. A few modern authors use the name Podaxon indica which made a "new combination" but apparently that is the only reason for its use. According to my views based on the type, Podaxon pistillaris differs from Podaxon aegyptiacus in having scanty subhyaline capillitium.

This appears to be the most frequent species in Australia and we have seen three collections. Two at Kew from "Darling River, Kennedy 1887" and "near Sydney, E. P. Ramsey" and one collection at Berlin from Baron von Mueller.*

THE GENUS GYMNOGLOSSUM

Peridium wanting. Gleba of permanent cells, closely related to Secotium. Capillitium none. Spores (fig. 2) elliptical, smooth.

GYMNOGLOSSUM STIPITATUM.—The only specimen known is at Kew (fig. 3) and was collected at Moonan Brook. N. S. W. by Miss Carter. Its general appearance now is like a shriveled pear. The peridium is entirely absent from the specimen hence it can be well compared to the subterranean genus Gauteria. Whether the peridium is absent at every stage of growth or has fallen off, I think, cannot be told from the specimen. A very good illustration is given of it in Cooke's Handbook I think, except the walls of the gleba cells are much too thick.

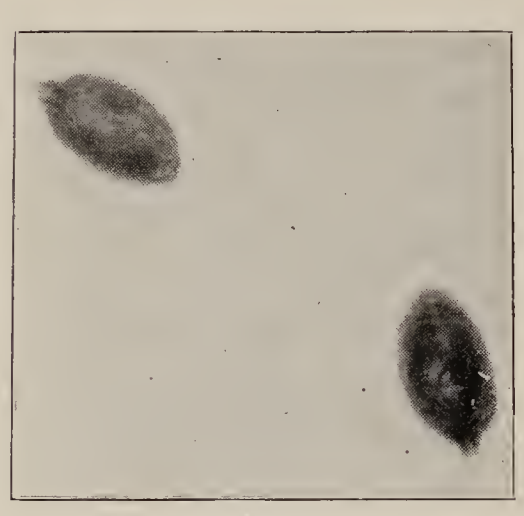

Fig. 2.

Fig. 3.

THE GENUS SECOTIUM

Plant with a stalk,† continuing as an axis to apex of the plant. Gleba permanent cells Peridium dehiscing by breaking away at the base. Spores mostly elliptical or oval.

One species of the genus Secotium is widely distributed over Europe and America, viz. S. acuminatum, but occurrence in Australia is not certain. The Australian species are mostly endemic and several of them are very imperfectly known.

SECOTIUM ERYTHROCEPHALUM (Plate 26, fig. 1, 2, 3, 4, 5 & 6)—Peridium thin, somewhat fleshy when fresh, subglobose. *bright red*. When fresh it is plump and smooth, but shrivels and

* The Kew specimens were labeled Podaxon calyptratus and Podaxon pistillaris and one is the basis of Podaxis axata in Cooke's Handbook. The Berlin specimen was labeled "Podaxon Muelleri n. s." but I think was never published. Those who believe in the advertising feature will however, kindly add Dr. Henning's name to it.

Fries based his "Podaxon calyptratus" as did Desvaux his "Podaxis senegalensis" on Bosc's old crude cut of "Lycoperdon axatum" (hence the name Podaxon axatus as recently changed). Bosc's old crude figure and his description give not the slightest clue to the species and nothing can be told from it excepting that it is a Podaxon. As to the species however, it is the purest guess work Massee designates Podaxon loandensis of Africa under this name, which was a good guess, both plants having come from the same country, but Podaxon loandensis differs from the Australian plant in the scantiness of its capillitium.

There are at Kew also the remnants of a plant from "Brisbane, Bailey" labeled "Podaxon carcinomalis var. elatior." It is a much taller plant than the South African plant Podaxon carcinomalis, with a stem about an inch thick. The spores are very much like the African plant, but I should not wish to form an opinion on this specimen.

† All the well known Australian species have long stalks but species from other parts of the world sometimes have very short stalks.

wrinkles in drying. Stem 3 to 5 cm. fleshy, inserted in the base of the pileus. Gleba light brown color with large irregular cells. Spores elliptical, smooth. light yellow under the microscope, about 6x12 mic.

This was the second species of Secotium known. It was beautifully described and figured by Tulasne (Ann. Sci. Nat. 44–115). It appears to be the most frequent species in Australasia ; abundant specimens are at Kew, Paris and Upsala from New Zealand and Tasmania. We have seen none from Australia. Most of the specimens are labeled as growing on the ground, but we note one from Colenso "on rotten wood."*

Specimens in our Collection.

Christ Church, New Zealand, Robert Brown.

SECOTIUM COARCTATUM (Plate 26, fig. 7 & 8).—Peridium obovate, pale tan color, constricted at the base, the margin somewhat irregularly torn, evidently forming a veil in the young plant. Stem 3 to 5 cm. long, reaching the apex of the peridium. Gleba light brown, formed of small irregular cells. Remote from the stem below, and covered with a membrane forming a cup into which the stem is inserted. Spores small, smooth, oval, 5x6 mic.

But one collection of this plant is surely known, collected by Drummond, Swan River about sixty years ago. The specimens existing are rather fragmentary, and we could obtain no good illustration from them. Berkeley however, gave a good illustration and description (Hook. Jour. 45–63).

Recently a very similar and probably the same species was collected in Texas, U. S. A by W. H. Long, Jr. The only difference we can note is that the gleba in the American plant is much darker color. The illustrations are made from the American plant and an unusually large specimen. The plant is apparently as rare in the United States as in Australia, for we know of only these two collections and we are not sure they are the same species. The Australian plant is said to be strongly scented.

sporum

SECOTIUM MELANOCEPHALUM (Plate 26, fig. 9, 10, 11 & 12).—Pileus 5–8 cm. in diameter, subglobose. Stem 5–8 cm. high, thick, solid. Gleba dark brown, almost black, with small irregular cells remote from the stem below. Spores dark, almost black, smooth, oval, 6x8 mic.

This plant differs from all other known species by the dark color of the gleba and spores. It is only known from one collection by Drummond at Swan River made about sixty years ago. We present on our plate, photographs of these specimens as they are preserved at Kew. The sticks shown in one are put through the specimen to hold the stem in place.

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* A recent European writer, Dr. Hollos, who evidently never saw a specimen, published that Secotium erythrocephalum is the young condition of Secotium acuminatum of Europe The doctor never made a worse guess in his life and the publication of such statements does not advance science.

Secotium acuminatum is a very common plant in the United States, Northern Africa, Hungary and Russia, but I do not feel assured of its occurrence in Australia from the small fragments so labeled that I have seen. The determination is very doubtful.

Secotium scabrosum (Grev. 20–35). All that is known of this plant is a single head with the stem gone. It has a close resemblance to erythrocephalum, but has larger, *rough* spores.

Secotium virescens (Grev. 19–47) is based on the merest fragment.

Secotium Gunnii (Grev. 19–96) is based on the merest fragment and is probably I think Secotium coarctatum although the spores are a little larger.

Secotium Rodwayi (Kew Bull. 01–158). These little specimens are about the size of peas. Said to be subterranean and only exposed when thrown up by marsupials. The spores, almost globose and *rough* are quite peculiar. In these specimens they are almost hyaline. I think the plants are not mature.

Secotium lilacense (N. Zea. Flor.) is based on a lilac colored figure. It is said to grow on wood. There are no specimens known.

Secotium leucocephalum (Grev. 19–95). These specimens were collected by Berggren in New Zealand and at first supposed to be pale forms of S. erythrocephalum, which they closely resemble in general appearance. They were separated when it was noticed that they had rough spores. I did not get a photograph of them. I should call the color pale, but not white.

THE GENUS CLAVOGASTER.

Plant clavate, stipitate. Peridium single, dehiscing (?) Columella (?). Gleba of permanent cells. Spores smooth, oblong, pedicellate.

Fig. 4.

CLAVOGASTER NOVO-ZELANDICUS. — This plant is known from a single half specimen (fig. 4) collected at Auckland New Zealand by Dr. Häusler and preserved at Berlin. It has been claimed that the plant belongs to the genus Cauloglossum* and the name Cauloglossum novo-zelandicum proposed. It seems to me the plant is closer to the genus Secotium, having the same spores and gleba. I could not tell whether it has a columella or not. As long as the plant is known from such scanty material, the name might just as well be left as it is, until more material is found. It would be recognized at once by its shape.

THE GENUS TYLOSTOMA.

Peridium globose, furnished with a protruding tubular mouth or opening irregularly, stipitate. At the base the peridium has a sort of "socket" into which the stipe is inserted. Gleba of branched sometimes septate threads and abundant, globose spores.

The genus Tylostoma is wide spread over the earth and the species are not well worked out. The Australian collections are very scanty, and I feel, very imperfectly known. I shall not attempt a description from such material.

* A genus known only from the United States.

TYLOSTOMA MAMMOSUM (Fig. 5).—There is one collection at Kew "White River 1870" which I think is the same as the European species. This species is the most common one in Europe and the only one known to occur in England.

Fig. 5.

TYLOSTOMA LEPROSUM.—I have seen only a very poor specimen. It is not as "spotted" as its name indicates. The "lurid umber mealy scurf" is the ordinary veil that all Tylostomas have which in this specimen happens to pull off somewhat in patches.

TYLOSTOMA WIGHTII—Was based on a plant from India. I have seen no specimen purporting to come from Australia.

TYLOSTOMA FIMBRIATUM.—There are specimens so labeled from Swan River, but their mouths do not show. Notwithstanding a recent "picture" has been made, showing the supposed "fimbriate mouth" character of this European species, I have been unable to find in Museums any specimen from Europe with such a mouth, and I question if such a species exists in Europe. There are species with such mouths in South America.

TYLOSTOMA ALBUM.—The specimen on which this is based is old, weathered, and bleached out. It has a large head and a short thick stalk, but I could not make out its mouth characters.

TYLOSTOMA PULCHELLUM.—Said to be a minute species that grows on branches(?). It was described by Saccardo (Bull. Soc. Myc. 89, p. 118). I have seen no specimens.

We have received Tylostomas very scantily from our Australian correspondents. A single specimen from F. M. Reader, Victoria, is we think, Tylostoma Purpusii recently described from the Western United States. A specimen from J. G. O. Tepper has a protruding mouth and would ordinarily be referred to Tylostoma mammosum of Europe, but it is not that species.

THE GENUS CHLAMYDOPUS.

Peridium globose, seated on the broad, concave apex of the stem. Capillitium and spores as in the genus Tylostoma. Stipe long, thick and concave at the apex tapering to the base. Volva persistent as a cup at base of plant (usually absent in herbarium specimens.)

The genus Chlamydopus can well be (as it is by some authors) classed with the genus Tylostoma. It differs in the attachment of the peridium to the stem. In Chlamydopus the peridium is seated on the broad, concave apex of the stem. In Tylostoma the stem is inserted into a "socket" in the base of the peridium.

CHLAMYDOPUS MEYENIANUS. — But one species is known originally from Peru, but found also in Western United States (cfr. Myc. Notes, p 134, plate 10). But one specimen (fig. 6) is known from Australia, collected Gascoyne River by Mrs Gribble and described (Grev. 15–94) as Tylostoma maximum.

Fig. 6.

THE GENUS PHELLORINA.

Plants with a long stalk, not prolonged to the apex of the peridium. Gleba homogenous, consisting of globose spores and scanty capillitium threads.

The genus Phellorina was proposed by Berkeley (Hook. Jour. 43–417) for a stalked plant from South Africa. The stem of this specimen was hollow, but no one knows if the plant that grew on the next hill had a "hollow stem". Montagne proposed the genus Xylopodium on virtually the same plant from North Africa, the main difference being that his plant had a solid stem. There is a question if Montagne's and Berkeley's specimens are not co-specific ; there is no doubt they are co-generic and that Xylopodium is a synonym for Phellorina.

The genus Phellorina grows only in sandy countries It is known from South and North Africa, Australia, India, Afghanistan, and rarely in southern and western United States.

PHELLORINA DELASTREI (Plate 27, fig. 1 & 2).—Plants with a thick, woody stalk. Peridium double, the inner thin but firm, same texture and a continuation of the woody stem. Outer of large, loose, thin, scale-like membrane. The peridium when mature opens irregularly at the apex. Gleba uniform, filling the cavity, bright ferruginous in color. Capillitium scanty, light colored or subhyaline threads. Spores globose granular, 6–7 mic.

This species was described* from North Africa, where it is not rare. Its occurrence in Australia is based on a large specimen (Plate 27, fig. 2) at Kew, collected at Stewart's Range, Central Australia, by Charles Winnedse

It is considerably larger than the plant usually becomes in North Africa, and is the only specimen known from Australia.

PHELLORINA STROBILINA (Plate 27, fig. 3).—Plant with a thick, woody stem. Outer peridium cracking into large, thick, angular scales. Spores globose, verrucose, 5–6 mic.

This curious plant is known only from Australia and but two specimens; one the type at Berlin (see plate 27, fig. 3) from Rockhampton, Queensland, the other at Kew from Darling River, Bennett.

A grotesque figure purporting to represent the plant was published in Engler and Prantl.†

SYNONYMS. — Scleroderma strobilinum (Grev. 4–74), Areolatia strobilina (Sacc. 7–144) Xylopodium ochroleucum (Grev. 15–95) based on a very immature specimen.

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* Xylopodium Delastrei (Flo. Alg. p. 390.)

† If the "artist" who drew this figure took for his model an artichoke, such as is common in the French markets, he did fairly well, for the figure is very good of an artichoke. It has however, no resemblance to the puff-ball.

PHELLORINA AUSTRALIS.—Stem short. Outer peridium rugulose,* light yellow. Gleba bright ochraceous. Spores globose, rough, 5–6 mic.

Fig. 7.

It is with considerable doubt that we refer a specimen received from F. M. Reader (Fig. 7) to Berkeley's species. The plant differs from Phellorina Delastrei in its shorter stem, the peridium not covered with loose scales, the bright ochraceous color of the gleba. The type specimen of Phellorina australis (Xylopodium australe Linn. Jour. 13, 171) at Kew is very old, almost without gleba and has a much longer stem than the plant sent by Mr Reader.

Specimens in our Collection.

Warracknabeal, Australia, F. M. Reader.

THE GENUS BATTARREA.

Young plants enclosed in a volva. Peridium stalked, opening circumscissally, the top falling away leaving the gleba borne on a lower half of the peridium. Gleba yellow-ferruginous, consisting of globose, minutely warted spores, subhyaline capillitium, and a special capillitium that no other genus has This "false capillitium" consists of thick cells with the walls spirally thickened which are known as "annulated cells."

The genus Battarrea is a wide-spread genus, but the individuals are usually of rare occurrence. The plants (see plate 28) present a strange appearance. Recently the theory has been advanced that all forms belong to the same species and it must be admitted that the gleba characters, spores, capillitium and "annulate cells" are nearly the same in all of them. However, the plants vary in different countries very much as to size and stature as well as the nature of the scales on the stem and I think five species† or forms can be distinguished.

BATTARREA PHALLOIDES (Plate 28, fig. 1) —This is the little species, with fine stem scales which grows in England and France. Many of the specimens we have seen have stems no thicker than a lead pencil. Such little plants from Australia are at Kew, collected at Israelite Bay by Miss Brooks.

BATTARREA STEVENII (Plate 28, fig. 2 & 3).- This form is originally known from Russia. It differs from the English form in its more robust growth and the thick, lacerated scales covering the stipe. It is unquestionably only a form of B. phalloides and cannot be distinguished by any sharp lines. There are specimens from Australia

* Probably from drying. It seems to me it was even and smooth when fresh.

† Battarrea phalloides, Stevensii, Digueti, Guicciardiniana and levispora.

at Kew, from "Swan River" and from "Victoria."* We present on our plate, photograph of our West American plant as we have no specimens from Australia.

THE GENUS POLYSACCUM.

Peridium a single layer, when mature very fragile, breaking irregularly or crumbling away. Gleba consisting of numerous cells, containing the spores † Walls of the gleba cells permanent, crumbling away as the spores are dissipated. Capillitium none ‡ Spores globose, rough.

This genus is easily recognized on account of the permanent gleba cells, little sacs (peridioles) that give the plants a honeycombed appearance when broken. It is rather a rare genus in America and Europe, but seems to be quite common in Australia, judging from the number of specimens I have received.

The genus is close to Scleroderma, some specimens having the gleba-cell walls so fragile that the plants can be taken for Scleroderma. There exists in the tissue of the peridium and walls of the peridioles a yellow coloring matter readily soluble in water. As it occurs in the plant it is black, but dissolved in water it is yellow. The plant is still used in the country districts of France (I am told by Monsieur P. Hariot of the Museum of Paris) for dyeing purposes.§

POLYSACCUM PISOCARPIUM.—Peridium subglobose, contracted into a short rooting stem. Spores globose, warted.

The "species" of Polysaccum are much more puzzling than the genus, because they shade into each other and it is not practicable to draw sharp lines between. The characters of the "species" are drawn from color of gleba, size and shape of plants and neither character is of any value. Extreme forms seem widely different and would be good species if it were not that more specimens occur that are intermediate between the extreme forms than typical of them. The following are convenient names to designate extreme forms.

POLYSACCUM PISOCARPIUM (Plate 29, fig. 1 & 2).—The usual form that occurs in Australia. Sub-globose contracted into a short, rooting stem. Typically illustrated (Plate 29, fig. 1).

SYNONYMS.—Polysaccum album (Grev. 20–36) a young condition with smooth, white, even peridium. Polysaccum australe (Ann. Sci. Nat. 3-9-136). Polysacum microcarpum, (Grev. 16–28) a small spored form, quite frequent in Australia, but is not

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* Two species have been described from Australia, neither however, presenting any points of specific importance.

Battarrea Mulleri (Grev. 9–3) described as white, because an old weather bleached specimen as frequently found in collections.

Battarrea Tepperiana (Bull. Soc. Myc. 89–XXXIV) is a small form with very scaly stem, but there is nothing specific about it.

† These cells are often called peridioles, but they are quite different in their nature from those of the Nidulariaceae or the genus Arachnion.

‡ Remains of the hyphae of the walls of the gleba-cells are usually mixed with the spores.

§ Which suggests a query to the modern name changers who have dug up Pisolithus arenarius why they did not dig up Persoon's specific name tinctorium which is both prior and more appropriate.

known in Europe or America.* Polysaccum umbrinum, a form with umber-brown gleba. It was described as Scleroderma umbrinum (Grev. 19–45) but the perfect peridioles are quite evident in the type specimen. Favillea argillacea (Fungi Natal, p. 32), is probably a synonym.†

POLYSACCUM CRASSIPES (Plate 29, fig. 3 & 4).—Peridium tapering into a strong, thick, rooting base. The typical form in Europe and America is a strong plant with a thick, rooting base as large as a man's wrist. I have not seen the typical form from Australia. Smaller forms are more common and shade into the previous form. Fig. 4 is from an Australian specimen.

SYNONYMS.— Polysaccum turgidum (Fr. Syst. 3–53) has been recorded from Australia, Polysaccum marmoratum (Linn. Jour. 13-171) a small, slender, spotted form due to unequal development of the coloring matter in the peridium

POLYSACCUM TUBEROSUM (Plate 29, fig. 5 & 6).—A globose form with scarcely any stem or rooting base. It is rare in Europe and usually has a black, smooth peridium. I have seen no typical specimens from Australia, but Polysaccum pusillum (Jour. de Bot. 03–13) from New Caledonia I consider a synonym.

POLYSACCUM CONFUSUM—(Grev. 16–76) (Syn. Polysaccum australe Grev. 5–29) is a form with small spores, almost smooth, and very thin walls to the peridioles. The figure Handbook No. 124 is much too yellow and the peridioles are not near so large as there shown.

Specimens in our Collection.

(Typical form as to shape)

Adelaide, Australia, Walter Gill, (Spores vary 6–12 mic.)
New Caledonia, from P. Hariot, (Spores 6–7 mic.)
Melbourne, Australia, W. R. Guilfoyle, (Spores 8–9 mic.)

(Form approximating crassipes)

Melbourne, W. R. Guilfoyle, (Spores 6–7 mic.)
Sydney, Australia, R. T. Baker, (Spores 8–9 mic.)

(Form tuberosum)

Grantville, Australia, J. T. Paul, (Spores 5–6 mic.)
New Caledonia, from P. Hariot (Spores 8–12 mic.)

THE GENUS SCLERODERMA.

Peridium single, usually thick, opening by an irregular mouth or (in one section of the genus) splitting into stellate segments. Gleba homogenous. Capillitium none. Spores globose, rough, usually mixed with remains of the hyphae tissue

Scleroderma is common and of world wide distribution. The genus can be recognized at once, but the species are very puzzling, running into each other in a most perplexing manner.‡ The genus is readily divided into two sections.

Sterrebeckia. Peridium splitting into stellate lobes.¶
Euscleroderma. Peridium opening by an irregular mouth.

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* The spores of the European forms run 8–10 mic. Many specimens from Australia have spores 5–7 mic.

† The type does not exist. The genus is said to have "rare capillitium from the base of the peridium." I have seen in Fries' herbarium a specimen of Favillea degenerans (Plant. Priess p. 159, Polysaccum? degenerans Cooke's Hand. p. 245) which is a Polysaccum with very fragile peridioles.

‡ The Friesian arrangement of species has generally been followed in Europe since the appearance of Systema. The following are the leading characters of the Friesian species:

S. Geaster, Peridium splitting into stellate lobes.
S. vulgare, Peridium thick opening by an irregular mouth.
S. verrucosum, Peridium thin, opening by an irregular mouth.
S. Bovista, yellow flocci mixed in the gleba.

Scleroderma vulgare, I think should be split in two species following Persoon. S. aurantiacum with large rough scaly warts. S. cepa relatively smooth and paler. It is very rarely that we find specimens of Sclerodermas without yellow flocci in the gleba though the character is much more strongly developed in some specimens than in others. Still I feel that S. Bovista is not a practicable species.

¶ This section is the basis of the genus "Sclerangium", a genus I think based on an error. (cfr. Myc. Notes, p. 182.)

SECTION STERREBECKIA.

SCLERODERMA GEASTER (Plate 30, fig. 1, 2 & 3) —Peridium thick, black, opening by stellate lobes.

This is not a rare plant in Europe and the United States, but I have no notes of having seen the typical form from Australia. It can be recognized even in the unopened state by the thick rough, (pale colored when young) peridium.

Specimens in our Collection.

New Caledonia, given by P. Hariot.

SCLERODERMA FLAVIDUM (Plate 30, fig. 4, 5 & 6).—Peridium smooth, thick, yellowish, opening by stellate lobes.

This is the common form in Australia and the numerous specimens that reached Berkeley were always referred to Scleroderma Geaster. It can well be considered a small. smooth, yellow form of that species with a thinner peridium. The plant is not rare in the United States, less frequent in Europe.

Unopened specimens cannot be told from Scleroderma cepa.

Specimens in our Collection.

Australia, *Adelaide*, Walter Gill. *Melbourne*, W. R. Guilfoyle.

SECTION EUSCLERODERMA.

SCLERODERMA CEPA (Plate 31, fig. 1).—Peridium thick, smooth, yellowish, opening by an irregular mouth.

This is not a rare species and widely distributed. The following from Australia may be unexpanded specimens of Scleroderma flavidum.

Specimens in our Collection.

Andover, New Zealand, Robert Brown. *Sydney, Australia*, R. T. Baker.

SCLERODERMA TEXENSE (Plate 31, fig. 2, 3, 4 & 5).—Peridium thick, smooth. Cells of the gleba subpersistent.

We have seen at Kew several collections from Australia, of this species, originally noted from Texas. It is characterized by the persistent gleba cells, a character tending to throw the plant into the genus Polysaccum.† It is a rare plant in the United States and does not occur in Europe to our knowledge It is really, I think, an exaggerated form of the plant with yellow flocci which Fries called Scleroderma Bovista.

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† The genera Scleroderma and Polysaccum run together in the nature of the gleba and in an intermediate case we decide by the nature of the peridium.

NOTE.—We have found at Kew no type specimens of Scleroderma pandanaceum (Linn. Jour. 13–171). Scleroderma aureum (Grev. 18–26), Scleroderma australe (Grev. 18–26). One of them is said to have "smooth" spores which would be a very unusual character in the genus Scleroderma.

SCLERODERMA AURANTIACUM (Plate 31, fig. 6 & 7).—Peridium thick, rough with large scales, yellowish, opening by an irregular mouth.

This is the most common form in Europe and America. We have also a fine typical collection from India. In the United States it generally occurs associated with chestnut trees. We have no record of having seen the typical form from Australia, but do not doubt that it occurs there. Having no photograph of an Australian specimen we present illustration from America.

SCLERODERMA VERRUCOSUM (Plate 31, fig. 8 & 9).—Peridium thin, yellowish, densely marked with small scales.

The character of this species is the thin peridium. It is a misnamed plant, for it is not near as "warty" as the preceding species. The typical form occurs in Europe and usually has a strong rooting base In the United States the typical form is very local* but we have very common and widely distributed a little thin form which is a good "geographical species" and which we shall call Scleroderma tenerum. The plant varies to such an extent, it is difficult to draw the line. The following specimen from New Zealand is not typical. Our figure is the European plant.

Specimen in our Collection.

Wellington, New Zealand, Miss Jessie Dunn.

THE GENUS GEASTER.

Peridia double. Exoperidium splitting into segments and revolute away from the endoperidium. Mouth single. Capillitium mostly simple. Spores globose, mostly warty or minutely warty.

The genus Geaster is a large genus found in all countries. It is popularly known under the name "earth stars." A pamphlet "The Geastrae" in which the species of Europe and America (22 in number) are fully considered and illustrated was issued by the writer in 1902.† In this pamphlet the genus was divided into the following sections:

Section 1.—Rigidae,
Exoperidium strongly hygroscopic rigidly incurved when dry.

Section 2.—Non-Rigidae,
Exoperidium not strongly hygroscopic.

Sub section 1.—Mouths sulcate.
Sub section 2.—Mouths even.

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* Confined to a few stations on the Atlantic Coast.

† It will be sent on application to Lloyd Library, Cincinnati, Ohio.

RIGIDAE.

This section is a very natural division of the genus readily recognized by the rigid incurved exoperidium segments of the dried specimens.

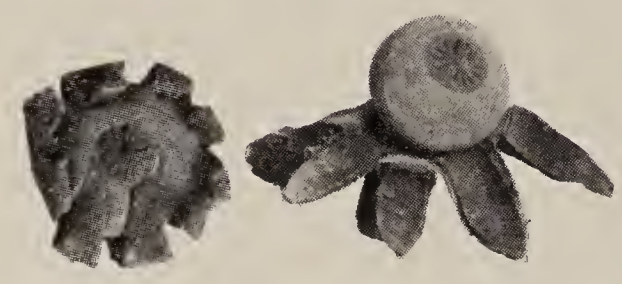

Fig. 8.

GEASTER DRUMMONDII.—Exoperidium strongly hygroscopic. Endoperidium sessile. Mouth sulcate, *darker color than the remainder of the peridium.*

This beautiful little species has only been collected once in Australia by Drummond many years ago. It is marked by the *dark* sulcate mouth differing in this respect from Geaster striatulus.* Our figure 8 is from the type specimens at Kew.

GEASTER STRIATULUS — Exoperidium strongly hygroscopic. Endoperidium sessile. Mouth sulcate, concolorous with balance of the peridium.

Fig. 9.

This little species was described (Grev. 9–3) from Australia. Though I have seen no specimens from Australia, this little plant is of wide distribution, reaching me from Sweden, Hungary, Africa and United States. It is everywhere a rare species Our figure (9) is made from a Hungarian specimen.

SYNONYMS. — Geaster Drummondii (Geastrae page 12, *not Berkeley*). Geaster umbilicatus, (Morgan's Flora *not Fries*). Geaster ambiguus,(Gast. Hung. *not Montagne*). Geaster Schweinfurthii, (Eng. Jahr. 14–361). Geaster mammosus (Ellis Exs. No. 110, *not Fries*).

GEASTER FLORIFORMIS.—Exoperidium thin, strongly hygroscopic. Endoperidium sessile. Mouth even, indefinite.

Fig. 10.

This species can be readily distinguished from the preceding by the mouth which is not sulcate The plant varies much in size (cfr. Myc Notes, p. 143), from a little tiny form not larger than a pea† to specimens with endoperidium a centimeter in diameter. The usual size is as we figure it (fig. 10) from American specimen. There are two collections at Kew from N. S. Wales and Victoria, both correctly labeled.

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* We regret that in our Geaster pamphlet we took another's opinion that Geaster Drummondii is the same as Geaster striatulus. The dark mouth which is the feature of the plant, is as good a character as exists in the Geasters. True, that specimens I have seen sometimes have this character only faintly indicated, but there are no "species" in this genus in which intermediate forms do not occur.

† Synonym. Geaster hungaricus Gast. Hung., p. 64.

SYNONYMS.—Geaster delicatus (Morgan's Flora, also Geastrae p. 11), Geaster hungaricus (Gast. Hung. p. 65, a small form.)

Geaster argenteus, specimens I have seen so labeled from Brisbane appear to me to be large form of G. floriformis bleached by exposure to the weather.

Specimens in our Collection.

New Zealand, Miss Jessie Dunn.

GEASTER SIMULANS.—Exoperidium thick, strongly hygroscopic. Endoperidium sessile, opening by an indefinite mouth. Spores small, globose, 4–5 mic.

This plant from Drummond Australia (fig. 11), I found in Museum at Paris, sent by Berkeley labeled Geaster rufescens. And at Kew under the same label and also the same collection (Swan River 174), labeled G. hygrometricus. It has no resemblance whatever to G. rufescens as now understood, but it is so close to G. hygrometricus that I doubt if any ordinary observer can tell them apart, judging from external appearances. The spores (fig. 12x1000) readliy distinguish it, being in this species the ordinary size of Geaster spores 4–5 mic. Geaster hygrometricus can always be recognized at once by having large rough spores (cfr Geastrae p. 8) 10–12 mic. in diameter, such as no other known species of Geaster has *

Fig. 11.

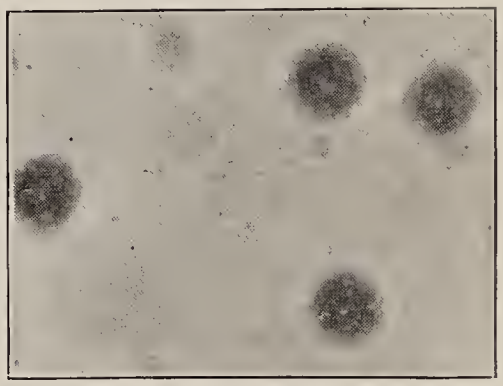

Fig. 12.

SECTION 2.—NON-RIGIDAE.

Sub-Section 1.—Mouths Sulcate.

GEASTER PLICATUS.—Exoperidium revolute. Mycelium layer generally adnate. Pedicel slender. Inner peridium subglobose, with a protruding sulcate mouth, *marked at the base with a definite area, strongly plicate.*†

* From the scanty knowledge we have of the Australian puff-ball forms the "flora" seems to be as marked in the absence of species common to the remainder of the world as in the occurrence of species peculiar to the country. Geaster hygrometricus is a species common over the greater portion of the world. We have noted specimens from all over Europe and America, also Canary Islands, Madagascar, Guam, India, China, Japan, Madeira, Algiers and Persia, but we have no record of having seen a single specimen from Australia.

† All Geasters with sulcate mouths and pedunculate endoperidia viz:

Geaster pectinatus, G. Bryantii, G. asper and G. Schmidelii are easily considered a single species as intermediate forms connecting them all are frequent. There is however, a definite idea associated with each species or rather name viz:

Geaster plicatus, a definite plicate area at base of endoperidium.

Geaster Bryantii a groove at base of endoperidium.

Geaster pectinatus, absence of a definite plicate area or groove, though striae are frequent in the European plant.

Geaster Schmidelii, *small size* and thicker pedicel.

Fig. 13.

This species is at home in Asia and Australasia seeming to replace Geaster pectinatus and G. Bryantii of Europe. It was well described by Berkeley (Ann. Nat. Hist. 3–399) as Geaster plicatus from some specimens from Madras which are still preserved at Kew labeled "Geaster striatus var. plicatus Klotz." About 20 years later Berkeley redescribed it (Proc. Am. Acad. 4–124) from Bonin Island as Geaster biplicatus which would be a better name. Geaster Thwaitsii (Sacc. 7–471) from Ceylon has also the same peculiar characters. We have noted specimens in the above three collections at Kew from India, Ceylon and Bonin Islands and from New Caledonia at Paris, but the only typical plants from Australia we have seen were sent us by Mr. R. T. Baker, Sydney, Australia. Fig 13 is a photograph of these beautiful and characteristic plants.

Specimens in our Collection.

Sydney, Australia, R. T. Baker.

GEASTER PECTINATUS.—Exoperidium revolute, the mycelial layer usually adnate. Endoperidium pedicellate, even or slightly striate at the base. Mouth sulcate, beaked.

Fig. 14.

The home of Geaster pectinatus is Sweden where it is perhaps the most frequent species. It is rare in the greater portion of Europe, being replaced by Geaster Bryantii In the United States both species are rare. In Australia the large typical Swedish form I have never seen, but the plant called Geaster tenuipes (Hook. Jour. 48–576) I should refer to this species though smaller and intermediate between plicatus and pectinatus Two collections are at Kew, from Tasmania and N. S. Wales. The figure in Flora Tasmania, while good of the specimen from which it was made (still preserved at Kew) is not characteristic of the species, which usually has a more beaked mouth and exoperidium not concave but revolute. Fig. 14 is from an American specimen.

GEASTER SCHMIDELII.—Exoperidium revolute. Endoperidium with short, thick pedicel. Mouth sulcate.

This little plant, rare both in Europe and United States, is separated from G. pectinatus (into which it merges by many connecting forms) by its small size and thick pedicel. Its occurrence in Australia is based on a single plant (fig. 15) received by me from J. G. O Tepper. This specimen is doubtful on account of its light color, but we think this plant was bleached.

Fig. 15.

Specimen in our Collection.

Norwood, Australia, J. G. O. Tepper.

GEASTER ARCHERI.—Young plant acute. Exoperidium usually saccate, sometimes revolute. Endoperidium globose, *sessile*. Mouth sulcate.

This plant belongs to the reddish series and can be at once distinguished from all the preceding species by its *sessile* endoperidium. It is an infrequent plant both in Europe and America, and the only specimen we have seen from Australia was collected in Tasmania by Archer. It was described in Geastrae as Geaster Morganii but since having assured ourselves that it is the same as Berkeley named from Tasmania, we take pleasure in correcting it. The plant is Geaster saccatus in everything except the indefinite sulcate mouth. The illustration is from an American plant.

Fig 16.

GEASTER BERKELEYI.—Young plant acute. Exoperidium usually saccate, sometimes revolute. Endoperidium globose, *sessile*, furfuraceous granular. Mouth sulcate.

While described by nearly the same terms as Geaster Archeri, it is a larger plant with usually a rough endoperidium. It corresponds mainly to Geaster triplex excepting the sulcate mouth. It is a local plant only known from England and Australia. The Australian plants we have seen at Kew have the exoperidium thicker and cut in more narrow segments than the English plant and the endoperidium is not so rough. Our illustration (fig 17) is from the English plant.

Fig. 17,

Sub-Section 2.—Mouths Even.

Plants Epigeous.

GEASTER MIRABILIS. Plants growing densely gregarious, the mycelium forming a dense cushion. Exoperidium light-colored, smooth. Endoperidium sessile, dark colored, contrasting with the light exoperidium.

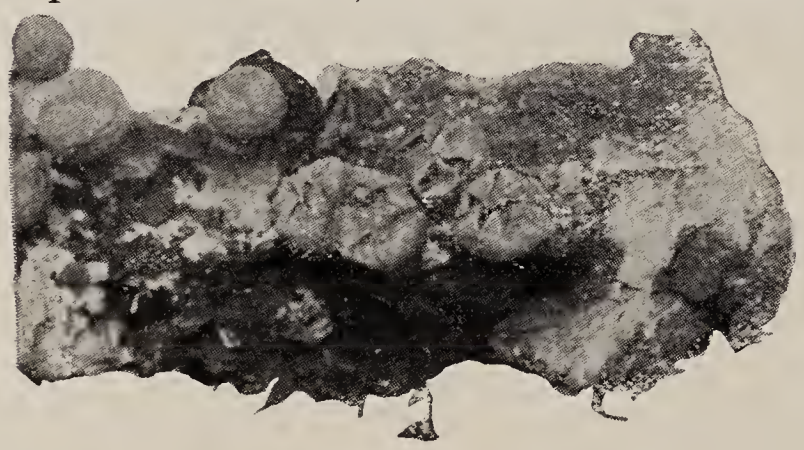

Fig. 18

This is a very variable plant, widely distributed but only in warm countries. It differs from most Geasters in that the plants are epigeous, developing on the top of the surface, also in the plants being borne densely gregarious on an effused mycelial subiculum.

Fig. 19.

FORMS.

The plants vary much in size and in shape of unexpanded plants. Usually they are globose, sometimes somewhat oval. The typical form (Fig. 18) is very small ½ cm. in diameter but the only Australian form we have seen is larger about size of fig. 19. This large form has been called Geaster subiculosus (Grev. 15-97).

GEASTER VELUTINUS.—This species best known from the United States is epigeous and has a globose young form. We are not sure, but think Geaster dubius (Linn. Jour. 16–40) only known from a single collection of unexpanded plants made at Pennant Hill Pawametta on the voyage of the Challenger, is a young plant of this species. These specimens are smaller and not so velutinate as the American plant. It is to Berkeley's credit that he knew them to be unopened Geasters and did not refer them to the "genus Cycloderma."

Plants Not Epigeous.

EXOPERIDIUM FORNICATE.

In many species of Geaster occasionally the inner layer of the exoperidium splits away and arches up over the outer layer producing the form of plant known as "fornicate." Only two species are known however, in which this character is habitual.* Of these two species, I have seen, from Australia, a single specimen of Geaster fornicatus at Kew (labeled G. limbatus). The other fornicate species, G. coronatus, very common in the pine woods of Europe, is unknown from Australia

GEASTER FORNICATUS.—Outer peridium strongly fornicate, the mycelial layer forming a cup at base of plant. Fibrillose layer arched above the cup to which it is attached by the tips of the segments. Inner peridium urn shape, tapering below into a short thick peduncle. Mouth indefinite.

A single specimen of this plant is at Kew collected at Brisbane. The distribution of the species in the world is most peculiar. It is frequent in England, Hungary and Russia but absent from the remainder of Europe. It is known from but two localities in the United States, Texas and Catalina Island. I have seen specimens also from Mauritius, Cape Good Hope, Algeria and Hawaii. It seems to occur only in widely separated localities and to be absent from the greater portion of the earth's surface.

Fig. 20.

Exoperidium Saccate or Revolute.

ENDOPERIDIUM STALKED.

GEASTER MINIMUS.—Exoperidium revolute, cut to about the middle. Endoperidium with a short but distinct pedicel. Mouth definite.

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* Geaster velutinus takes the fornicate form frequently in warm countries but does not in more temperate regions.

Fig. 21.

This is one of the smallest species, very common in the United States. It is more rare in Europe. From Australia we have seen several collections at Kew and have received a specimen (Fig. 21) from J. G. O. Tepper, Norwood, that corresponds exactly with the American plant.

Specimen in our Collection.

Norwood, Australia, J. G. O. Tepper.

GEASTER RUFESCENS.—Unexpanded plant globose. Exoperidium revolute. Pedicel short but thick. Mouth indefinite.

Fig. 22.

This species which is rather rare both in Europe and America, is a reddish plant almost the same as Geaster limbatus, which is not known from Australia, and is a black plant. The only specimen we have seen from Australia is the plant called Geaster Readeri (Grev. 16–73) which is smaller than the usual American form. Our illustration (fig. 22) is from an American plant.

ENDOPERIDIUM SESSILE.

GEASTER SACCATUS.—Unexpanded plant acute, Mycelium sub-basal. Exoperidium saccate, the segments revolute. Endoperidium sessile, the mouth definite.

Fig. 23.

This species is a plant of world wide distribution, common in the United States. It is more rare in Europe where it is generally known as Geaster lageniformis. It seems to be the most frequent species in Australia. Of the eleven collections of Geasters we have received from that country, six belong to this one species. Numerous collections are also at Kew. Our figures (23) all made from Australian specimens, show three expanded plants, one unexpanded, and the outer view of a specimen.

Compared to the American plant, the Australian has notably larger spores and the exoperidium is not so flaccid, but we do not feel it practicable to separate them. Geaster vittatus (Grev. 9–3) is a form with exoperidium longitudinally cracked.

GEASTER CORIACEUS (Trans. N. Z. Inst. 22, 451) is a large form with a firmer exoperidium, intermediate between Geaster saccatus and G. triplex.

Geaster Guilfoylei (Sacc. 7. 472) is a synonym for G. saccatus (not for G. rufescens as stated).

Specimens in our Collection.

Australia, *Grantville*, J. T. Paul ; *Melbourne*, W. R. Guilfoyle (two collections); *Sydney*, R T. Baker.

New Zealand, *Andover*, Robt. Brown; *Christ Church*, Robert Brown.

GEASTER TRIPLEX. — Unexpanded plant acute. Exoperidium saccate, sometimes revolute. Endoperidium sessile, mouth definite.

Geaster triplex has the same characters as G. saccatus, but the typical form is so much larger that it would not be taken for the same plant. Still in the United States intermediate specimens reach me often that are difficult to refer to either. There is a specimen at Kew from Miss Carter, N. S. Wales, that I should refer to triplex. Our illustration is from the American plant.

Fig. 24.

Notes on other Species attributed to Australasia.

Geaster fimbriatus is a common species of Europe, but I think grows no where else. It is close to saccatus, but has an indefinite mouth. All specimens so labeled at Kew from Australia have definite mouths and I should refer them to saccatus. Geaster australis (Flo. Tasmania 2–264), comes nearer to fimbriatus than specimens so labeled.

Geaster Speggazzinianus, I have seen no specimens so labeled from Australia, but the species from South America was based on large floriformis.

Geaster coronatus (Trans. N. Z. Inst. 16–362) I have seen no specimens and name is preoccupied.

Geaster affinis (l. c.) I do not know.

Geaster lugubris, is a synonym for Geaster mammosus but there are no specimens of this plant from Australia in museums of Europe.

Geaster pusillus (Pl. Priess 2–139). No type exists and no one knows anything about it.

THE GENUS BOVISTA.

Sterile base none. Capillitium of short, separate, branching threads. Peridium cartilaginous, papery.

The genus Bovista is a very common genus in Europe and America, but strangely rare in Australia.* The plants are typical "tumblers" breaking away from the roots when mature and rolling over the ground. The following is the only species we have seen from Australia.

Fig. 25.

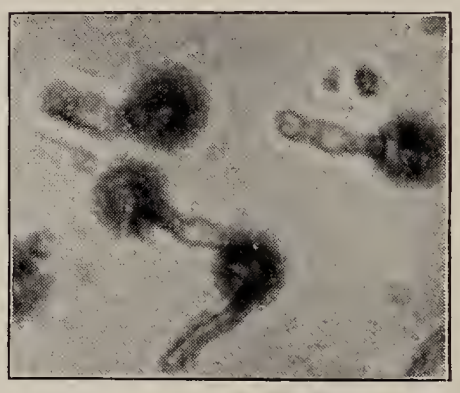

Fig. 26.

BOVISTA BRUNNEA.—Globose. Peridium *brown*, smooth, cartilaginous. Capillitium of separate threads (fig. 25). Spores globose (or slightly oval) smooth, 4–5 mic., with long slender pedicels (fig. 26).

This plant was collected in New Zealand by Colenso. Berkeley notes the close resemblance of this plant to Bovista plumbea from which it seems to differ only in the brown color of the peridium, not a very good specific character.

THE GENUS MYCENASTRUM.

Fig. 27.

This genus is characterized by the globose form, thick peridium and absence of sterile base. The threads of the Australian species are short, separate and furnished with little spiny points (fig. 27.) No other known puff-ball has a similar capillitium.†

MYCENASTRUM CORIUM (Fig. 28) Peridium thick, hard, almost woody. It varies in thickness from one to four millimeters. When young the cortex is smooth or with a felty appearance, but it dries up and disappears in the very old specimens. Often it cracks in areas as shown in our fig. 28.

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* Of the seven species given in Cooke's Handbook, five are Catastomas and one a Calvatia. The apparent absence from the Australian flora of Bovista plumbea, nigrescens and pila, the three common species of America and Europe, also of Lanopila bicolor a similar plant of the tropics, seems remarkable.

† But whether it is advisable to limit the genus to this one species on this character is not assured.

Fig. 28.—Mycenastrum Corium.

The gleba first turns bright olive,* finally dark purplish brown. Capillitium of peculiar, short, pointed threads, bearing little spiny points. Spores (fig. 29) globose, large, 8–10 mic. warted.

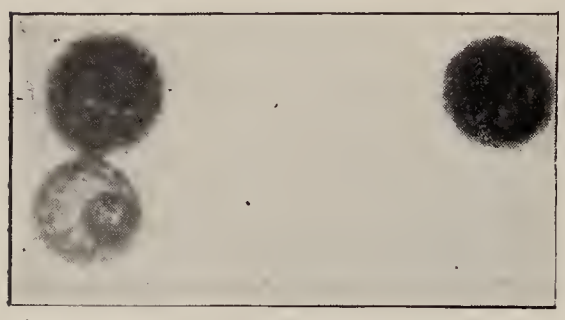

Fig. 29.

This plant is of wide distribution in the world, and on sandy plains often occurs in the greatest abundance. It has received a large number of synonyms of which Mycenastrum olivaceum and Mycenastrum phaeotrichum (see foot note, *) have been applied to Australian specimens. They are compiled in Saccardo as Scleroderma olivaceum and Scleroderma phaeotrichum.†

Specimens in our Collection.

New Zealand, *Andover*, Robert Brown.

Australia, *Warracknabeal*, F. M. Reader, *Norwood*, J. G. O. Tepper.

Melbourne, W. R. Guilfoyle.

THE GENUS CATASTOMA.

Plants globose without sterile base. Exoperidium usually thick and breaking away from the inner peridium excepting a small portion which generally remains as little cup at the base.‡ Capillitium (Fig.30)§ of short, simple, unbranched threads, which is *the character* of the genus. Spores globose, more or less rough, sometimes pedicellate.

Fig. 30.

Australia is rich in this genus and of of the four species, three are known, each from a single collection and only known from Australia. . The gleba colors vary much but we would not place too much stress on a character drawn from one collection.

*If specimens are collected when the gleba is in the olive condition, it retains this color. Mycenastrum olivaceum (Griev. 16-33) is based on such specimens. Mycenastrum phaeotrichum (Hook. Jour. 43-48) originally referred to Mycenastrum Corium by Perkeley, was afterwards separated by him because the gleba color did not correspond to that of the specimens received from Paris. The plant is the same in other particulars, and the gleba color of any particular specimen is of no importance.

†Of the many changes in plant names that are made in compiling in Saccardo, none perhaps have less merit than the system which still persists of compiling Mycenastrum as Scleroderma. The two genera are widely different. And when Bovistellas are described as Mycenastrums, as they have been, to compile them as Sclerodermas reaches the limit, for of the characters on which genera are based these two have not a single one in common.

‡The original American species have a very peculiar structure (see Myc. Notes p. 121). When the plant is mature the outer peridium breaks in a somewhat circumscissal manner, part remaining as a cup in the ground and part remaining attached to the inner peridium as a kind of cup. The inner peridium with this cup at the top becomes loose and is rolled over the surface of the ground. It opens by a little mouth *opposite* the portion to which the cup is attached, hence that part of the inner peridium which is the base of the growing plant. Most species of Catastoma have a small portion of the exoperidium attached to the specimen as collected but that they all grow in this way is not assured. Catastoma anomala *does not* as I have had an opportunity to observe in some fine specimens sent me by R. T. Baker.

§The genus Catastoma is of wide distribution, and is most strangely distinct from Bovista in its capillitium characters (cfr. figs. 25 and 30). The genus was universally overlooked by European writers on puff balls until it was pointed out by Morgan an American mycologist. Then it was at once adopted by all recent European writers and one of them (Hollos) has tried to steal it by the trickery of name jugglery.

Gleba olive,	Catastoma hypogaeum,
" umber,	" anomalum,
" reddish,	" Muelleri,
" purplish,	" hyalothrix,

CATASTOMA HYPOGAEUM (Plate 32, fig. 1, 2 and 3).—Exoperidium rather thin, breaking irregularly (in these specimens mostly attached). Endoperidium thin, yellowish. Gleba bright olive. Spores small, 6 mic, rather strongly rough. Capillitium colored, simple curled threads.

Type Specimen (Bovista hypogaea, Grev. 20-35) at Kew from Mrs. Martin, Gippsland.

Specimens in our Collection.

Christ Church, New Zealand, Robert M. Laing. The gleba are not so bright olive as the types at Kew but the plant is in every other respect the same.

CATASTOMA ANOMALUM (Plate 32, fig. 4, 5 and 6).—Exoperidium very thin, breaking irregularly. Endoperidium rich brown, with a strong protruding mouth (like Tylostoma mammosum). Gleba dark umber. Spores globose, very slightly rough, 6-7 mic. not pedicellate. Capillitium light colored, curled, simple.

This unique little species is distinguished by the protruding mouth such as no other known species has. Type at Kew (Bovista anomala Grev. 18-6) from Mrs. Martin, Victoria, specimens also "Gippsland" and "Delatite River, Rev. R. Thom" at Kew. The same species is found in Berkeley's Herbarium, from St. Domingo and I have seen what I take for the same species at Berlin from Africa. The specific name anomala was quite appropriate to it when described as a "Bovista" for it is an anomalous Bovista, but as a Catastoma, the name would be better if it were "typicum".

Specimens in our Collection.

Rockwood Australia, R. T. Baker.

CATASTOMA MUELLERI (Plate 32, fig. 7 and 8).—Exoperidium thin, reddish, sub-persistent. Endoperidium thin, reddish. Gleba reddish umber. Spores large 10 mic. *very* rough, without pedicels. Capillitium light colored.

This species has the largest, roughest spores of any known. It is close to Catastoma Zeyheri of Africa but has a different exoperidium.

Type at Kew (Bovista Muelleri Linn. Jour, 13-171), from Herbert's Creek, Queensland, E. M. Bowman.

CATASTOMA HYALOTHRIX (Plate 32, fig. 9, 10 and 11).—Exoperidium thick, in the nature of a sand case, usually partly adherent but when peeling off leaving a scar on the endoperidium. Endoperidium dark purplish. Gleba purplish. Spores about 10 mic. rough, with a pedicel about as long. Capillitium simple, curled, light colored, (not "hyaline").

Type at Kew (Bovista hyalothrix Grev. 16-73) from C. French, Lake Allacutya. The plant is very close to Catastoma castaneum, from Africa, (type in Museum at Paris) as to color, and peridium characters, but spores are larger, (5-7 mic. in African plant). I think however they are forms of one species.

NOTE.—Lycoperdon bovistoides (Bull Soc. Myc. 89-118) seems from the illustration to be a Catastoma but the "sterile base" removes it from this genus. We have seen no specimen.

THE GENUS BOVISTELLA.

Peridium flaccid, opening by a definite mouth. Sterile base usually well developed, sometimes very slightly or not at all. Capillitium of separate branched threads, or of threads with pointed branches. Spores pedicellate.

We would extend the limits of this genus as above for reasons that will be discussed more fully when we consider the genus in Mycological Notes. As we should define the genus it includes all plants heretofore classed as Lycoperdons which have pedicellate spores. As thus defined it includes four known Australian species. The original definition of the genus based on a single species requires that the capillitium threads should be "free" and separate. Neither of these four species under this definition is included in the genus.*

BOVISTELLA ASPERA (Plate 33, fig. 6, 7, 8, 9 and 10.— Peridium subglobose. with a strong tap root. Cortex of short, thick spines converging in fours, when old, largely falling away leaving the peridium furfuraceous. Sterile base none or very slightly developed.† Gleba olive. Capillitium long, branched threads running out to points. Spores globose, smooth, 4-5 mic. with thin pedicels 8-10 mic.

There are specimens at Kew collected by Mueller at Haidinger Range in 1861. We have also received a collection from W. W. Watts, Sydney. The plant was originally described from Chili (Bovista aspera Ann. Sci. Nat. 3-5-162).

Specimens in our Collection.

Sydney Australia, W. W. Watts.

BOVISTELLA AUSTRALIANA Plate 33, fig. 1, 2, 3, 4 and 5).— Plant with a well developed sterile base of large cells. Cortex minute, nodular, furfuraceous. Peridium becoming smooth when old. Gleba olive umber. Capillitium long branching threads with pointed branches. Spores globose, smooth, 4 mic. with slender pedicels 12-15 mic.

This is a small species with strong tap root. The shape varies from subglobose to somewhat elongated as shown in our plate. There is a corresponding variance in the development of the sterile bases.

Specimens in our Collection.

Grantville Australia, J. T. Paul. *Andover, New Zealand*, Robt. Brown.

BOVISTELLA GLABESCENS—Plant with a well developed sterile base of small cells. Smooth (now, but probably had a prominent cortex.) Gleba olive umber. Capillitium long, intertwined, branched, with pointed branches. Spores globose 5 mic. smooth, with slender pedicels One collection at Kew from Tasmania. Described as Lycoperdon glabescens (Flo. Tasm. 2, 264).

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*On page 85 Mycological Notes we considered the separate or attached threads as the essentials of the genus Bovistella to distinguish it from Lycoperdon, but since studying many plants of this group we conclude that the pedicellate spores are the only practical distinction to be drawn.

†The type specimens at Paris have no sterile bases, but specimens we have received from Australia, surely the same plant, have a *very slight* development not over 2 mm. thick.

BOVISTELLA GUNNII—Plant subglobose (with little or no sterile base) Cortex furfuraceous. Gleba olive-umber. Capillitium long, branched, intertwined with pointed branches. Spores globose, smooth, 5 mic. with long pedicels.

This plant is based on one collection by Gunn, Tasmania, now at Kew. It differs from preceding species in its subglobose form and absence (entire?) of sterile base. The nature of the cortex is similar to that of Bovistella Ohiensis, the common species of the United States but the threads are quite different. It was described (Flo. Tasmania 2, 264), as Lycoperdon Gunnii.

THE GENUS LYCOPERDON.

Peridium flaccid, with or without a sterile base, opening by a small definite mouth. Cortex smooth, or usually covered with spines, either minute or large, which are generally arranged in fours. Capillitium of long, branched, intertwining threads. Spores usually globose, (sometimes oval) rough or smooth, often apiculate but not pedicellate.

This is the largest and most difficult genus of puff-balls. It is very abundant in the temperate regions and the numerous species form a large part of the "puff-ball flora" of these regions. In Australia it is not relatively so abundant and if we should judge by the specimens (26) that we have received from our Australian correspondents they mostly belong to two types, the "polymorphum" and the "pratense" type. There are a few others at Kew, but very few.

THE "POLYMORPHUM" SECTION.

Cortex of very minute, furfuraceous spines. Spores olive, smooth, capillitium long branched, *deeply colored* threads. Sterile base compact, varying much in its development.

The sterile base and its relative development even in plants of the same collection is a very varying factor. The following "species", depending largely on size and absence of development of the sterile base, are really forms of one species.

LYCOPERDON POLYMORPHUM (Plate 34, fig. 1, 2, 3, 4, 5 and 6).—Cortex of minute furfuraceous spines, (rarely coalescing to form little warts). Gleba compact, olive. Sterile base peculiar, being formed of compact tissue of very small or no cells, very similar to the fertile portion.* Capillitium long, intertwined, deeply colored threads. Spores globose, olive, smooth, 4 mic.

This plant is quite common in Europe and Australia. In the United States, it usually takes a subglobose form, with a very little sterile base (called Lycoperdon cepaeforme). There is a tradition in Europe that it is the plant illustrated by Schaeffer (t. 294) under the name Lycoperdon furfuraceum and the plant is often still so called in European works. The cut of Schaeffer is very crude and doubtful. The first definite information we were able to obtain in tracing it back in European history is the work of Vittadini where the plant is well

*Usually the sterile base of Lycoperdon is composed of large cells very different from the fertile portion.

illustrated and described under the name Lycoperdon polymorphum and Vittadini's specimens are still in existence. We adopt it as it is a most suitable name and in addition Vittadini was the first to point out the peculiar sterile base character by which it differs from other species. The plant is quite common in Australia and is the same form that occurs in Europe excepting the cells of the sterile base which (while still very small) are slightly larger than in the European plant.

Specimens in our Collection.

New Zealand, Miss Jessie Dunn.

Australia, *Warracknabeal*, F. M. Reader. *Grantville*, J. T. Paul.

Melbourne, W. R. Guilfoyle, (Mr. Guilfoyle's specimens are very dark color and approximate the next.)

LYCOPERDON NIGRUM.—With all the internal characters of Lycoperdon polymorphum this plant differs only in its very dark color (almost black in fact). It is certainly only a dark form.

Specimens in our Collection.

Australia Warracknabeal, F. M. Reader.

LYCOPERDON CEPAEFORME (Fig. 31).—Plant subglobose, with very little sterile base. Other characters as the typical form of L. polymorphum.

Fig. 31.

This form which is common and well marked in the United States is not so distinct in Australia where it shades into the typical form.

Specimens in our Collection.

New Zealand, *Wellington*, Miss Jessie Dunn. *Andover*, Robert Brown.

Australia, *Sydney*, R. T. Baker. *Adelaide*, Walter Gill.

LYCOPERDON PUSILLUM (fig. 32).—This is a little form devoid of sterile base and with a large thick tap root. The Australian plant is larger, has a more strongly developed root. and the color of the gleba is not so dark, but I do not think it is practicable to keep the Australian plant distinct (under the name Lycoperdon australe) as has been proposed. I am unable to distinguish any marked difference in the spores as shown in a recent picture. Lycoperdon microspermum (Hook. Jour. 51-172) appears to me the same.

Fig. 32.

Specimens in our Collection.

New Zealand, *Andover*, Robert Brown.

Australia, *Norwood*, J. G. O. Tepper.

LYCOPERDON DERMOXANTHUM (fig. 33).—This is a little form devoid of sterile base and with the warts soldered together in nodules.

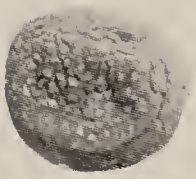

Fig. 33.

Specimens in our Collection.

Australia, *Warracknabeal*, F. M. Reader.

THE "PRATENSE" SECTION.

Sterile portion separated from the fertile portion by a distinct diaphragm. Capillitium hyaline, septate.

LYCOPERDON PRATENSE (plate 34, fig. 7, 8, 9, 10, 11 and 12).—Peridium depressed. Cortex short spines (about 2 mm. long), falling away from the old specimens and leaving the peridium smooth. Peridium opening by a large irregular mouth.* Sterile portion of large cells separated from the fertile portion by a distinct diaphragm. Gleba olive, capillitium hyaline, (or faintly colored) septate, branched threads. Spores globose, smooth, light colored 4 mic †

We adopt the name Lycoperdon pratense, there being a tradition in Europe that it is Persoon's species and the plant being generally so known now. Still there is no direct evidence on the point; Persoon left no specimens and his figure which is quite characteristic as to shape has the surface broken into areas by cracks, never a feature of any specimen I have ever seen. The first definite evidence is that it is Lycoperdon hyemale of Vittadini. Not only his specimens exist, but he clearly characterizes it, pointing out the peculiar diaphragm so marked in this species. Unfortunately he referred it to Bulliard's figure of Lycoperdon hyemale, and the figure is probably not this plant and would always be a bone of contention if the name were adopted The plant is very common in Europe and Australia and has the same characters in both countries. It does not occur in the United States to my knowledge.

A good notice and figure of the Australian plant was published in Proc. Linn. Soc. New South Wales (Nov. 1900) by D. McAlpine under the title "On the Australian Fairy-ring Puff-ball". Unfortunately he misdetermined the plant, referring it to Lycoperdon furfuraceum.

Synomyn, Lycoperdon natalense (Cooke's Handb).

Specimens in our Collection.

New Zealand, *Andover*, Robert Brown. *Wellington*, Miss Jessie Dunn.

Christ Church, Robert M. Laing and Robert Brown. *North Island*. J.S.Tennant.

Victoria, *Grantville*, J. T. Paul.

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*In its dehiscence this species is intermediate between Lycoperdon and Calvatia.

†The spores of this species are remarkably uniform in size.

THE "CRUCIATUM" SECTION.

Spores olive, smooth. Cortex of short cruciate spines, peeling off in patches.

Lycoperdon cruciatum the typical species, is very common in the United States, very rare in Europe and does not occur in Australia to my knowledge.

LYCOPERDON STELLATUM. — Cortex of strong, thick, rugulose, connivent spines, peeling off in patches and leaving the peridium smooth. Gleba olive. Spores smooth, globose, 5 mic. Capillitium colored.

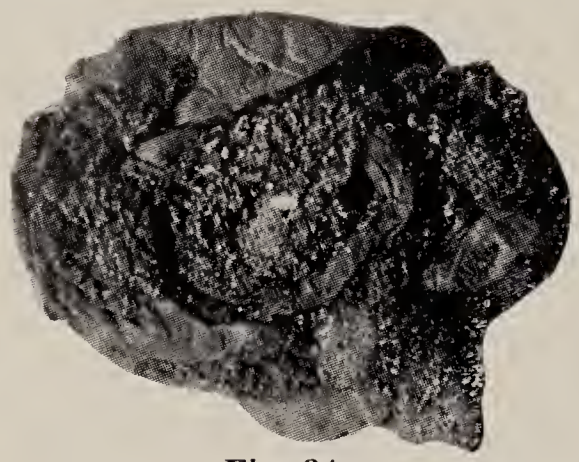

Fig. 34.

This is a strongly marked species known from a single specimen at Kew (fig. 34) from Miss Brooks, Israelite Bay, Australia. The specimen is not cut open and we cannot say as to the sterile base but it seems to be scanty. The plant is evidently closely related to cruciatum but differs in the larger, rough cortex spines.

THE "GEMMATUM" SECTION.

Gleba olive. Spores small, globose, smooth or minutely rough. Columella prominent.

Lycoperdon gemmatum and Lycoperdon pyriforme are the most common species that occur in the temperate regions of the world, and form a large part of all museum collections of puff-balls So numerous are they in the museums of Europe that we did not keep an itemized account of the specimens and cannot remember whether or not we have noted typical specimens from Australia. Both are recorded from Australia, but neither has reached me direct from my Australian correspondents.

LYCOPERDON GEMMATUM. —Cortex of *soldered* warts, like little "gems", which fall away and leave scars on the peridium. Gleba olive. Columella prominent. Spores small (4-5 mic,) globose, minutely rough, (almost smooth).

This species takes an infinite number of shapes in the temperate regions of the earth and varies much as to appearance but can always be recognized by the peculiar warts or the scars where the warts have fallen. We present photographs, (fig. 35) of a specimen (from America) covered with these peculiar warts and also one after the warts have fallen.

Fig. 35.

SYNONYMS.—The peculiar warts of this species were first and best described by Persoon under the name Lycoperdon perlatum. The name gemmatum however, is a much better name and has come into general use.

LYCOPERDON TASMANICUM.—This has the gemmate cortex but the spores are a little larger and more rough. I found it at Kew collected in Tasmania by Rodway. I doubt if the spore difference is enough to characterize a species.

LYCOPERDON COLENSOI.—This plant collected in New Zealand by Colenso was referred by Berkeley to Lycoperdon elongatum quite a different species of India. It was separated by Massee when he noted how different are its spores. It has soldered warts intermediate between gemmatum and pyriforme. I should have referred it to the former species.

LYCOPERDON PYRIFORME (fig. 36).—Cortex of small spines, sometimes somewhat nodular. Gleba olive. Columella prominent. Spores small (4-5 mic.) globose smooth.

This is a most common species in Europe and America and usually grows on rotten logs or stumps It takes a number of forms but is readily recognized by the characters above and the habitat. It always has long, white, cord-like mycelium roots.

Fig. 36.

THE "ATROPURPUREUM" SECTION.

Gleba purplish, spores large, rough, mixed with separated pedicels. This is a strongly marked section in Europe and America embracing such species as echinatum, atropurpureum, velatum and others all of which have nearly the same gleba and spores but differ in cortex characters. The only specimens we have seen of this section from Australia were called Lycoperdon violascens(Trans. R Mic. Soc.87-706). The specimens are old with smooth, very thin peridia but the cortex characters by which the species of this section are distinguished, having disappeared, we feel the specimens cannot be satisfactorily referred.

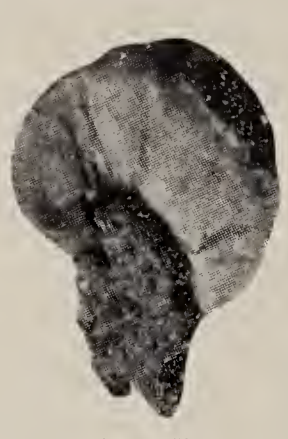

Fig. 37.

LYCOPERDON COPROPHILUM. — Plant subglobose, with white mycelium roots, cortex of short stiff, scabrous spines. Sterile base none. Gleba dark with faint tinge of purple. Spores small, (4 mic.) apiculate, slightly rough. Grew on dry cakes of cow manure.

This is a most peculiar species known only from Australia, and the only puff-ball to our knowledge growing on cakes of manure. It does not belong to the atropurpureum section of the genus having spores much too small, but we place it here for the present to avoid multiplying the sections. The type specimens at Kew (fig. 37) are from F. M. Bailey, Brisbane.

AN "ANOMALOUS" SECTION.

There is an anomalous section in the genus Lycoperdon which I doubt will be retained in the genus when its life history becomes known. The gleba is characterized by the scantiness of the capillitium and its nature is usually that of shreds rather than threads. The gleba has a resemblance to that of Lycogala though the plants are not Myxomycetes. Most of the species have very small, rough spores, the following being the only species we know with smooth spores.

Fig. 38.

LYCOPERDON TEPHRUM. — Peridium thick, and rigid. Cortex minute nodules. Sterile base none. Gleba olive. Capillitium scanty. Spores smooth globose 4 mic.

Grows on rotten wood. The plant (fig. 38) externally has a different appearance from Lycoperdons, but it is easier to note the difference than to describe it.

Specimens in our Collection.

Sydney Australia, R. T. Baker.

NOTE —I did not find type specimens of the following species or they were so scanty that I could gain no definite idea of them. Lycoperdon substellatum,(Trans. R. Mic. Soc. 87-720), Lycoperdon reticulatum (Flora N. Zea. 2-190) Lycoperdon mundulum (Grev. 9-3). The specimen from Australia referred to Lycoperdon Cookei I should call a Bovistella.

THE GENUS CALVATIA.

Sterile base none, or usually well developed. Peridium flaccid and brittle, dehiscing by the breaking up of the upper portion. Capillitium long, intertwined. The genus, although it is usually advertised as "Fries," was made known to science by Morgan, an American author. It is just beginning to be recognized in Europe. Formerly it was included in Lycoperdon but differs in the dehiscence of the peridium. In Lycoperdon the peridium opens by a small definite mouth. In Calvatia it breaks up in pieces and falls away exposing the gleba. Lycoperdons are usually small plants. Calvatia embraces all of the large species formerly called Lycoperdons.

CALVATIA LILACINA (Plate 35, fig. 1).—Sterile base usually strongly developed, sometimes almost none. Cortex smooth. Gleba always purplish, sometimes bright lilac color, sometimes more grayish but always with a purplish tinge. Capillitium long, branched, intertwined, uniform threads, very light colored under the microscope. Spores globose, rough, 5-7 mic.

This is a plant of world wide distribution and very variable as to the development of the sterile base. It can always be known by the purplish color of the gleba. In Europe it is of a southern range and has been usually called Lycoperdon fragile. In the United States it is very abundant extending north into Canada. Since the publication of Morgan's work it is generally known as Calvatia cyathiformis.* In Australia it is equally common and numerous specimens have reached Europe. The plant being quite variable has a number of synonyms of which Bovista lilacina (Hook. Jour. 45-62), Lycoperdon Novae-Zealandiae (Ann. Nat. Sci. 3-5-162), and Lycoperdon lilacinum (Handb. Aust. Fung). have been applied to, the Australian plant.

Specimens in our Collection.

Australia, Adelaide, Walter Gill. *Sydney,* R. T. Baker. *Grantville,* J. T. Paul.
New Zealand, Wellington, Miss Jessie Dunn.
New Caledonia, donated by P. Hariot, Museum, Paris.

CALVATIA CAELATA (Plate 36, fig. 1,2,3 and 4).—Plant obovoid or turbinate, rarely subglobose. Cortex a thick, floccose layer composed of dense warts split, forming coalescent spines, much split at the base† This cortex breaks up in an areolate manner, and finally disappears from old specimens of the sterile bases. Peridium breaking away irregularly forming a large lacerate opening. Gleba olive Capillitium of deeply colored threads two

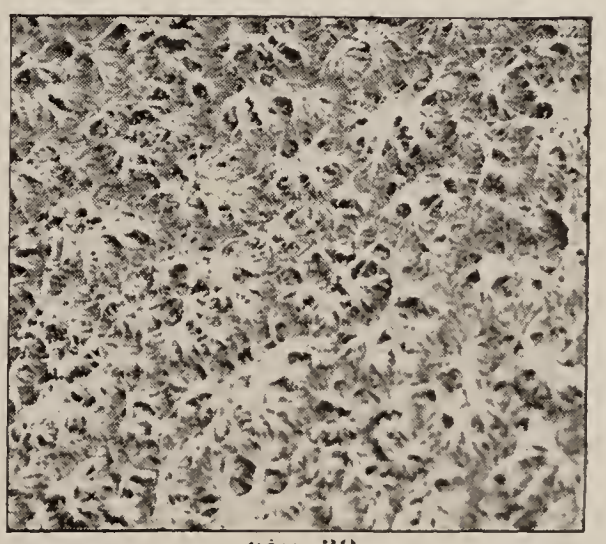

Fig. 39,

*While we employed this name at first, we have discarded it. It was founded on a blunder, and has no application whatever to the plant except a false one. On the other hand the name lilacina which Berkeley proposed is as suitable a name as could be applied to it

†A better idea of this cortex than we can express in words is given by our figure (39), *enlarged.*

or three times as thick as the spores. When ripe they break into short pieces.* Spores small, globose, 4-5 mic., smooth.

Calvatia caelata is not so widely distributed as the previous species. It grows quite commonly in Europe and the western portion of the United States. Two forms occur which at first view seem quite different. The usual plant has an even surface, and this form we would call Calvatia caelata because it is the common plant and the one usually so known. As a matter of history however, Bulliard's figure on which the name is based is the next form.

CALVATIA FONTANESII (Plate 36, figs. 2 and 4.)—Certainly only a form of the previous plant. The warts are thick and the surface broken into large areoles. This form is more rare in Europe and more common in our western United States. There is a New Zealand specimen at Kew from Colenso.

Calvatia favosa is a form with peridium becoming lacunose as shown on plate 36, fig. 3. It was figured by Rostkovius, and lacunosa would have been a better name for it. We have specimens of this form from Robert Brown, Andover, New Zealand.

Specimens in our Collection.

New Zealand, Christ Church, Robert M. Laing. *Andover*, Robert Brown.

CALVATIA GIGANTEA (Plate 37).—Plant globose, reaching often a *very large size*.† Peridium with a smooth cortex, when ripe breaking into fragments and falling away. Sterile portion none. or sometimes slightly developed, but compact, of the same texture as the fertile portion‡ Gleba bright yellow, then brownish olivaceous. Capillitium long, intertwined, branching, deeply colored threads about as thick as the spores. Spores globose, smooth, 4-5 mic.

This large plant which is popularly called the "giant puff-ball" is of wide distribution. It is of rather rare occurrence in the United States§ but one of my correspondents writes me it grows in great abundance in New Zealand. The thickness of the peridium varies. In New Zealand specimens from Robert Brown it is little over one mm. thick; in an American specimen fully 2 mm. No one can mistake the plant for it is the only *large globose* species known in Europe, Australia or the United States. Notwithstanding, it has a wealth of synonyms, viz: Calvatia maxima. Bovista maxima, Lycoperdon maximum, Lycoperdon Bovista, Globaria Bovista, Lycoperdon giganteum, Bovista gigantea, Globaria gigantea, Langermannia gigantea.

Specimens in our Collection.

New Zealand, Andover, Robert Brown, a liberal lot.

Oval spored form from J. G. O. Tepper, Norwood, Australia. We have some specimens with spores not truly globose but slightly oval. It has been suggested that this may be the original form of Calvatia gigantea and the name Calvatia primitiva proposed, and that the spores have become round through evolution, but of course that is merest supposition.

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*Hence the gleba of this species has very little cohesiveness and falls out from the specimen so readily that they are usually the "dirtiest" puff balls we receive.

†It has been stated that specimens have been collected three feet in diameter. I have several times seen them a foot and a half through.

‡When present it is of a different nature from the sterile base of most puff-balls. It is never formed of large cellular tissue as erroneously shown in Bulliard's figure.

§I have seen it growing but once.

CALVATIA CANDIDA (Plate 35, fig. 2, 3, and 4).—A very small plant, rarely over an inch in diameter, with a tap root. Peridium very smooth and shiny, thin and brittle, breaking away in pieces. Sterile base small, compact. Gleba olive. Capillitium of uniform, intertwined, branched threads, often septate and very light colored under the microscope. Spores globose, smooth,* 4-5 mic. slightly thicker than the threads.

This is a very rare plant in Europe, only a few collections being known. It was fairly well figured by Rostkovius but was really made known very recently by Dr. Hollós to whom all the credit should be given. It seems to be more abundant in Australia and three collections from that country have reached us. It is unknown from the American continent.

SYNONYMS.—Langermania candida (Sturm Flo 3-257) Lycoperdon candidum (Sacc. 7-483.)

Specimens in our Collection.

Australia, *Norwood*, J. G. O. Tepper. *Warracknabeal*, F. M. Reader.

Adelaide, Walter Gill.

CALVATIA OLIVACEA (Plate 35, fig. 5).—Peridium globose, 5 cm. in diameter. Peridium "thick, at first soft and pliant like leather", smooth. Gleba olive. Sterile base none. Capillitium long, colored. slightly thicker than the spores. Spores globose, smooth, 5 mic.

The only specimen known is the type (Bovista olivacea Grev. 16-77) at Kew from Reader, Australia. It is similar to the preceding species but is larger, peridium is thicker, and capillitium more deeply colored. It is well shown in Handbook fig. 118 excepting I find no pedicellate spores.

CALVATIA SINCLAIRII—Lycoperdon Sinclairii (Jour. R. Soc. 87-716), is founded on a sterile base of Calvatia collected in New Zealand by Sinclair. It has a thick reddish, smooth (now) peridium, pyriform, apiculate, smooth spores, and thick, deeply colored capillitium threads. Its affinities are close to Calvatia caelata.

THE GENUS GALLACEA.×

Peridium single. Gleba of permanent cells forming a thin layer adhering to the peridium, the plant being hollow at the center. Capillitium none. Spores fusiform.

This genus is based on "Mesophellia Scleroderma" (Grev. 14-11). The plant cannot be classed in the genus Mesophellia as its nature and the nature of the gleba is entirely different.

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*The spores are smooth under ordinary magnification. Under a very high power they are said to be minutely warty.

× See Patouillard. Bull. Soc. Myc. 27, 74. 1911

GALLACEA SCLERODERMA. — Peridium simple, globose, thin, ochraceous, externally broken into scale-like areas. Gleba olivaceous in color consisting of a layer of small irregular cells. which adhere to the peridium, the center of the specimen being hollow. Capillitium none. Spores (fig. 40) elliptical, hyaline, smooth, 4x10 mic.

Fig. 40.

This plant externally somewhat resembles Scleroderma aurantiacum in color and scales but the plant is so light and fragile that the resemblance stops with the exterior. It reminds me of an "oak-ball".* Only one specimen is known (fig. 41), now at Kew, which was collected by Reader, New Zealand.

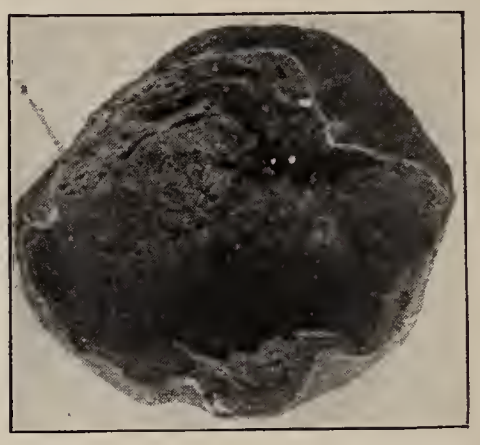

Fig. 41.

THE GENUS CASTOREUM.

Plants with a strong rooting stem. Peridium double, cartilaginous† opening (apparently) by an irregular fracture. Gleba homogeneous. Capillitium hyaline. Spores fusiform.

This is a most distinct genus known only from Australia. The spore relations are to Mesophellia but there is no genus that is very close to it.

CASTOREUM RADICATUM (Plate 38, fig. 1 and 2). – Peridia double, about of equal thickness, smooth, fibrous, tough, dehiscing? by an irregular opening. Gleba filling the cavity. Capillitium of flaccid, crumpled, white threads mixed with brownish spores. Spores fusiform, verrucose, about 10 x 5 mic.

This is a most curious plant, known from a couple of specimens at Kew, collected St. George's Bay, Tasmania by G. Wintle. One of the specimens (as shown on our plate) is double, but that double plants are usually borne on the same rooting stem is not probable. The collector states that the plant is "eaten by the kangaroos and bandicoots." The plant is well shown in Handbook fig 122, though the gleba is too yellow and threads are not tense and straight as shown.

THE GENUS ARACHNION

The genus Arachnion can be briefly described as being puff-balls within puff-balls. The entire interior (fig. 42, enlarged 3 times) of a ripe specimen is filled, not with dust (spores and capillitium) as most

*I do not know that Australian readers are familiar with "oak-balls." They are excrescences, a kind of gall, caused by an insect and very common on the oak (Quercus) in the United States.

†I know not why the inner peridium is described as "subgelatinous."

puff-balls, but with a granular substance that feels "gritty" when rubbed between the fingers. These granules are peridioles; they are little sacs containing spores. They are small but can be seen under a hand glass.

The genus is well known in the United States by one species, Arachnion album which is fairly common. Similar (or perhaps the same) species occur in South America, West Indies, South Africa and Australia. In the latter country its occurrence is based on a single known specimen collected more than sixty years ago.

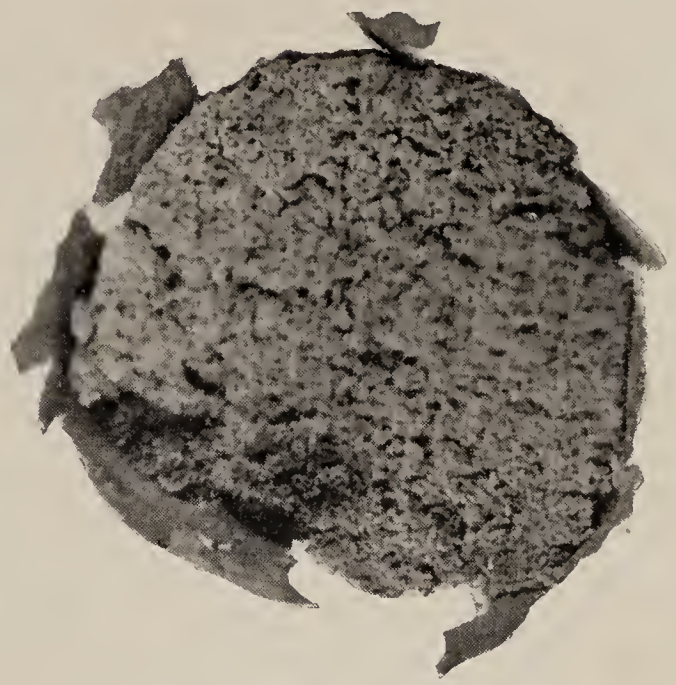

Fig. 42.

ARACHNION DRUMMONDII.—Plant globose, without sterile base, about 1 cm. in diameter. Peridium smooth, thin, fragile, rupturing irregularly. Peridioles irregular in size. Spores globose, smooth, 5-6 mic. apiculate, or short pedicellate.

Arachnion Drummondii is very doubtfully distinct from Arachnion album of the United States. The spores are slightly larger, more strongly apiculate and the habits of the plant according to the collector's notes are different.* The plant was named (Jour. Linn. 18-389) incidentally with Agaricus cycnopotamia (but can hardly be called described) as follows—"attached to the specimen is a species of Arachnion (the spores are globose and .0002–.0003 inch in diameter) which may be called A. Drummondii, Berk." This led to a funny error. Saccardo compiles it "ad Locellinam cycnopotamiam Berk," and in Cooke's Handbook we find the statement "Attached to Agaricus (Acetabularia) cycnopotamia." The plant has nothing whatever to do with the agaric excepting that Drummond sent it to Berkeley glued on the same sheet of paper.

THE GENUS MESOPHELLIA.

This is one of the most curious genera I have ever seen. It has little relationship to any other described genus. The plants are subterranean, growing in the sand. In the center is a hard core, white and of the texture of the finest grained hard wood. No other fungi to my knowledge produces a tissue as hard as this. Surrounding this core is the inner peridium, at a distance of 3 to 5 mm. from it, and joined to the core by ligaments of the same hard tissue that proceed from the

*"Enclosed you will find also some portion of a curious fungus with the habit of a small Lycoperdon. It is almost subterranean, just reaching the surface with its upper part. It differs from polysaccum in having the sacs uniformly not larger than a poppy seed, and in not having them inbedded in a matrix. Each sac small as it is contains numerous sporules. The whole is pure snow white turning yellow."—Drummond's note to Berkeley. It is a good account of the plant and shows Drummond was an observing man.

core. Between the core and the inner peridium is the gleba of a light greenish color. This consists of coarse, shreddy capillitium arranged in a parallel manner* proceeding from the core to the inner peridium. The spores abundant in the gleba are elliptical-fusiform, light greenish color, almost hyaline under the microscope. Only to phalloid spores can they be compared in shape and color. The outer peridium is thick, rough, with adhering sand, and formed of coarse fibrous tissue.

MESOPHELLIA ARENARIA (Plate 39, fig. 1, 2, 3, 4 and 5) — The description of which is covered in the above generic notes was first collected in Tasmania by Archer and well described and figured by Berkeley (Trans. Linn. 22-131). It was afterwards more abundantly collected by T. Muir "Near the entrance of the garden river West Australia" and sent to Berkeley by Mueller† in 1885. The spores are elliptical-fusiform, smooth, 4 x 12 mic.

"Diploderma glaucum" collected Scamander River by Wintle, I think is Mesophellia arenaria.

MESOPHELLIA INGRATISSIMA—This plant is described as "strong-scented" and as having spores 10-12 mic. in diameter. I did not find the type specimen at Kew.

MESOPHELLIA SABULOSA.‡—Appears to me very close to M. arenaria but differs in the nature of the exoperidium which instead of being formed of coarse fibrous tissue takes more the nature of an agglutinate sand case. The spores are also described as larger (7 x 14 mic.)

MESOPHELLIA PACHYTHRIX.⁂—Differs from M. arenaria in several respects. The capillitium is of a different color and much coarser, being compared in color and texture to the fibers of outer shell of a cocoanut. The spores are thicker being 5 x 11 mic. and are minutely warted.

THE GENUS MITREMYCES.

Exoperidium subgelatinous,‖ in the Australian species falling off like a cap. Endoperidium opening by longitudinal slits along the edges of raised, rayed teeth. Spores ochraceous, oblong-elliptical in the only known Australian species. Capillitium none. The spores are

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*In the little fragment of gleba that I brought home with me and from which our microphotograph (Plate 39, fig. 4) was made, it was impossible to preserve the parallel arrangement of the capillitium. However, in the specimen it is quite evident to the naked eye.

†Mueller was impressed with the novelty of this plant and wrote Berkeley a long letter requesting that it be called "Potoromyces loculatus Mueller." As Berkeley had already described it as Mesophellia arenaria he probably so informed Mueller. Twenty years latter Dr. Hollos, a Hungarian botanist found in the museum at Wien a specimen that Mueller had sent under his name. Dr. Hollos, innocent of any knowledge of Berkeley's work with the plant, at once published a description of the wonderful "new genus" Potoromyces (Nœv Kœz, 1902-155).

‡Diploderma sabulosum (Grev. 21-38),

⁂Diploderma pachythrix (Grev. 18-50).

NOTE—There is a specimen from Melbourne in Broome's herbarium, British Museum, labeled "Mesophellia arenaria" which is not this species and is probably not the genus. The gleba and spores are similar (the spores much shorter and smaller) but there is with the fragmentary specimen no "core" nor exoperidium. It is elongated in shape and I think was probably not subterranean.

‖An American species (M. cinnabarinus) is noted for the thick gelatinous exoperidium, resembling to some extent the volva of the phalloids. It breaks up in pieces and falls away. The Australian species differs from all other known species in having the exoperidium fall away *in a single piece* like a cap. From the dried specimen I judge it is not so gelatinous as other species.

contained in a special sac lining the endoperidium. As the plant matures the sac contracts forcing the spores through the slits of the rayed mouth.

The genus Mitremyces* is one of the strangest in the known puff-ball world. It occurs in the United States, Japan, Australia, Java, Ceylon, India and the Malay Peninsula. Eight species (with numerous synonyms) are known. But one from Australia.†

MITREMYCES FUSCUS. — Plant very dark color, almost black when dry.‡ Exoperidium (fig 43) falling off in one piece as a cap.§ Spores (fig. 44) elliptical, oblong, minutely rough, varying in size 7 to 10 mic.

This plant judging from the collections that have reached England is not rare in Australia. There are collections at Kew (fig. 45) from "Melbourne, Miss Campbell," "Tasmania, Milligan," "Melbourne, Berggren" "Epping Forest Van Dieman's Land, Lawrence," "Lake Muir, Th. Muir" and at the British Museum "Beenah Victoria, Miss Flora Campbell."

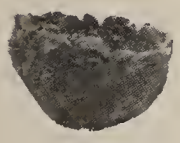


Fig. 43.

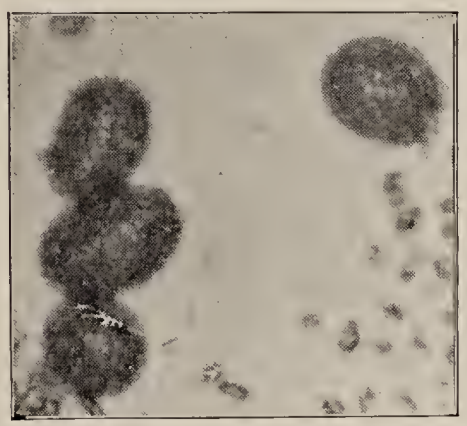


Fig. 44

Fig. 45

MITREMYCES LURIDUS (Fig. 46.)—With every character of the previous species excepting size, I can consider it only a small form of Mitremyces fuscus.‖ There is but one collection known viz. by Drummond, Swan River, many years ago.

Fig. 46.

*We use the generic name that was employed by Berkeley and by botanists generally for more than seventy years. Recently much confusion has been introduced by digging up an old name "Calostoma" for the purpose of making "new combinations." We strongly disapprove of this method of confusing names.

†If we consider, as I do, Mitremyces luridus as a small form of Mitremyces fuscus Mitremyces viridis in Cooke's Handbook is based on specimens so determined at the British Museum, collected by Miss Campbell at Beenah Victoria. It was afterwards described as Calostoma aeruginosa. It is Mitremyces fuscus *tout a fait*.

Mitremyces australis under which name Berkeley labeled several specimens at Kew is purely an error, I think due to misreading the specific name of Mylitta australis on the page following the description of Mitremyces fuscus.

Mitremyces coccineus (Sac. 7, 70), is also purely an error of compilation, no such species being described

‡In this respect the Australian species differs from all others known. Several are noted for their bright color, one, Mitremyces cinnabarinus of the United States being bright red.

§Another character in which the Australian species differs from all other known species.

‖When described it was said to differ from all species in not having a red lining to the endoperidium teeth. I think this is an error as I notice an indication of the red lining on the specimens but it has mostly faded out. I think there is no known exception to the rule that all species of Mitremyces have the lining mouth red when fresh.

EXCLUDED GENERA AND SPECIES.

PAUROCOTYLIS PILA.—This plant which was included by Berkeley in the Gastromycetes has been shown by Patouillard (Bull. Myc. 03-339) to belong to the Tuberaceae, having its spores in asci. We have received from Robert Brown, New Zealand some fine specimens of which we are enabled to present an enlarged photograph (fig. 47) that will give a correct view of the internal structure. The cuts heretofore issued have been very inaccurate. (Fig. 48) plant natural size, fig. 49 section.

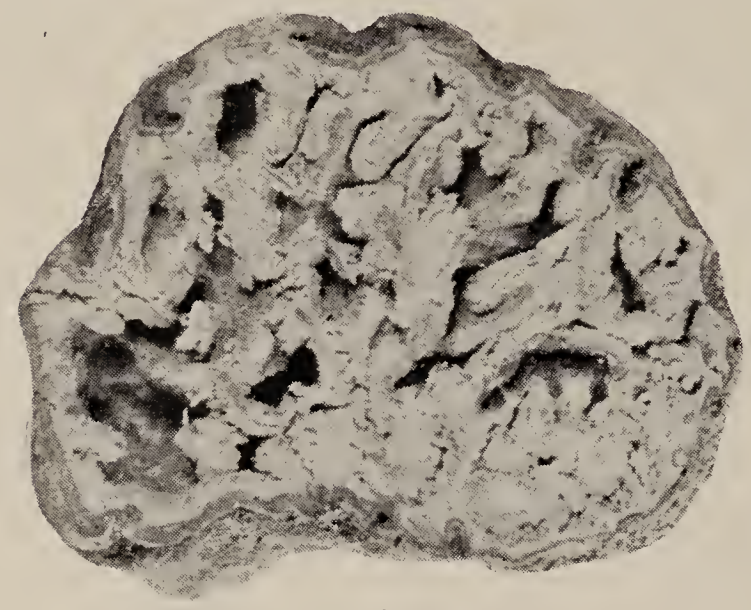


Fig. 47.

Fig. 48.

Fig. 49.

PROTOGLOSSUM LUTEUM.—We would class this plant as a Hymenogaster. We have never made a close study of this order, but the genus appears to us to be strongly distinct. The figure in Cooke's Handbook does not belong to the species, having been made from a misdetermined plant of quite a different nature and spores.

Cycloderma platysporum, Diploderma suberosum, Diploderma album, Diploderma fumosum and Diploderma melaspermum are all erroneous (cfr. Myc. Notes p. 181).

THE LLOYD LIBRARY AND MUSEUM.

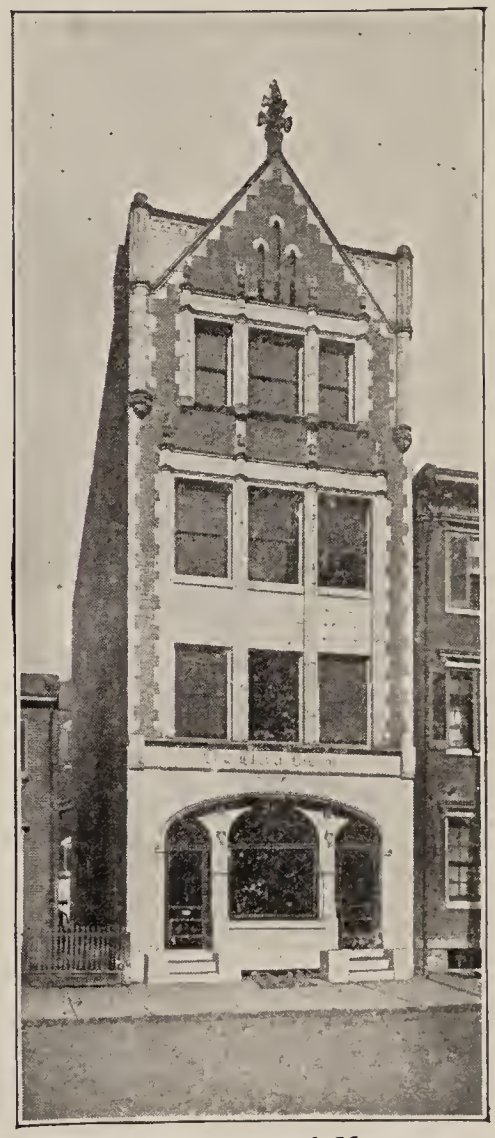
This institution, while nominally an incorporated organization, is in reality dependent upon the support of two brothers, C. G. and J. U. Lloyd, who provide the funds for its maintenance, each for his own department; the former Botany and especially Mycology, the latter Materia Medica and Pharmacy. The institution is located at No. 224 West Court St., Cincinnati, Ohio, and is a four story building erected by Mr. C. G. Lloyd for this purpose in 1902.

THE LIBRARY.

This is in charge of Captain William Holden, Librarian. It is devoted exclusively to the aforementioned subjects, and although of comparatively recent growth, it compares favorably, in number of volumes at least, with such old established libraries as are to be found at Kew. In monetary value, or in practical working value to the systematic botanist, the Lloyd Library does not compare with Kew, for the latter is a selected library of years of growth, devoted specially to the wants of the systematic botanist. The Lloyd Library aims eventually to embrace all books relating to botany, pharmacy, materia medica and allied sciences. With this object such subjects as physiological botany, elementary text books, technical botany, pharmacopoeis, etc., which would not be considered as in the scope of Kew are systematically collected in the Lloyd Library.

THE HERBARIUM.

This consists of about thirty thousand specimens (estimated) which were mostly obtained through exchange by C. G. Lloyd during the earlier years of his life. When Mr. Lloyd became interested in Mycology, some ten years ago, this feature was practically abandoned. Prof. W. H. Aiken has recently taken charge of this department and it is expected that from this time on the herbarium will have renewed life and activity.



Lloyd Library and Museum.

THE MUSEUM.

One floor of the building is devoted to a museum of fungi and there have accumulated many thousand specimens. During recent years Mr. C. G. Lloyd has devoted himself exclusively to the study of Gastromycetes, popularly known as the puff ball family. With the cooperation of a large number of correspondents from every country in the world, more specimens of these plants have found their way to this museum than can be found in all other museums in the world combined. Each specimen is named, and labeled with the name of the collector and locality, and is preserved in the museum, no matter how well the same species may be represented. Some common species, such as Lycoperdon gemmatum, are represented by over three hundred different collections.

ITS DESTINY.

This institution will never be sold or broken up. When the life works of its builders are finished, funds will be provided for its continuance under the care of some institution or university, best calculated to serve science. The entire collection of books and specimens is pledged by its founders to be donated intact to Science.

INDEX TO SPECIES.

Those so closely related to others that they may perhaps be better called subspecies, varieties or even forms, are indicated by a star (*).

NOTES

ON THE

AMANITAS

OF THE

Southern Appalachians.

PART I.

SUB-GENUS AMANITOPSIS.

ILLUSTRATED WITH THREE PLATES.

BY H. C. BEARDSLEE.

PUBLISHED BY LLOYD LIBRARY.

CINCINNATI, OHIO, U. S. A. SEPTEMBER, 1902.

AMANITA.

SUBGENUS AMANITOPSIS.

The Genus Amanita is known among the white-spored genera by having a universal veil entirely enclosing the young plant. This veil is distinct from the epidermis of the pileus. The genus is divided into two subgenera:

Annulus present, . . . Amanita.
Annulus none, . . Amanitopsis.

Some mycologists follow Saccardo in considering Amanitopsis as a distinct genus. We feel however that this is artificial classification. One of the plants we include in this section we consider as a variety of a plant of the typical genus Amanita.

KEY TO SUB-GENUS AMANITOPSIS.

Volva persisting as a membranaceous cup at the base of the stipe, . . 1.
Volva pulverulent or separating into scales, ... 2.

1. Pileus deeply striate on the margin, ... 1 A. vaginata.
1. Pileus even, or slightly striate on the margin . . 2 A. baccata.
2. Pileus gray or grayish-brown, mealy, . . . 3 A. farinosa.
2. Pileus brown or grayish brown, volva separating into scales, ... 4 A. strangulata.
2. Pileus yellow, pubescent, ... 5 A. pubescens.
2. Pileus white, scaly, ... 6 A. nivalis.
2. Pileus red, volva breaking up into warty fragments, 7 A. muscaria var. coccinea.

AMANITA VAGINATA.

Pileus ovate, becoming expanded and nearly plane, pallid, gray, tan, or brown in color, smooth or adorned with flat fragments of the volva, deeply sulcate-striate on the margin; lamellae white, free; stipe slender, tapering upward, more or less flocculose; volva membranous, persistent, free, lax. Spores globose, 7–10 mc. in diameter.

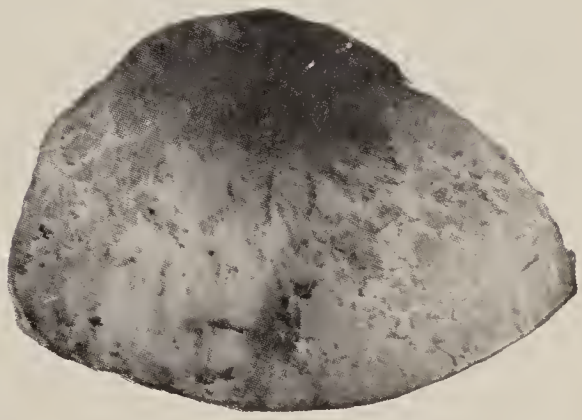
One of the most abundant and variable species on the Asheville plateau.

It is found in profusion during August, when its variable colors make it a puzzle to the collector. The free volva, and sulcate-striate pileus, readily distinguish it.

AMANITA BACCATA.

Pileus firm, convex, even or slightly striate on the margin, white, slightly colored on the disk and somewhat floccose scaly; stipe equal, or tapering upward, firm, stuffed, floccose; lamellae

PLATE 1.



AMANITA BACCATA.

broad (4–6″) at the center, rounded at the ends; volva firm and membranous, persistent, free at the margin and forming a fairly rigid cup at the base of the stipe. Spores elliptical, 11–14 x 5–7 mc.

The disposition of this species has been a puzzle. As will be seen below it is the species A. agglutinata as described by Berkeley, and is also A Barlæ and A Coccola of Europe. In the United States it has been included, doubtless with A. volvata.

The type of A. volvata however is so different from our plant that it is difficult to believe that the two are not distinct. The prominent features of the North Carolina plant, its white color, *broad gills*, and short stipe, which were present in all our specimens, are not present in the typical A. volvata.

Specimens and photographs have accordingly been submitted to Bresadola who writes that it is found quite generally in southern Europe, and sends a specimen from Portugal which corresponds with our plant in every particular. He believes it to be A. baccata founded by Fries on Michelius' figure, (Planche 80, fig. 4). It has also been called in Europe A. Barlae and A. Coccola.

We are also firmly convinced that this species is the lost A. agglutinata which was described by Berkeley from Curtis's specimens. The most marked characters of this species as we view it are the white color, short stipe, broad and rounded lamellae, and firm texture. *All of these characters* are noted in the original description, and the fact that the description also contains some inaccuracies can easily be understood by those familiar with "dried plant descriptions."

Prof. Farlow has very kindly compared my specimens with those in the Curtis Herbarium. He writes that the specimens of A. agglutinata are in a fair state of preservation considering their age, and are certainly much like our plant in general appearance. A difference was found in the spores which were "not more than 14 mc. long by 7 mc. broad in A. agglutinata and 14 or more by 5½ mc. in our plant." The measurement of the spores in the abundant material at hand shows however, that this difference is not constant, some plants having spores agreeing perfectly with the measurement of A. agglutinata while in others they are longer and not so broad.

It seems reasonably certain therefore that our lost A. agglutinata should be referred here.

AMANITA FARINOSA.

Pileus 1–2½ in. broad, gray or brownish-gray, mealy with gray particles which are thickest at the disk, deeply striate on the margin; lamellae white, free; stipe slender, pallid or gray, bulbous at the base. Spores broadly elliptical or subglobose, 6–7 mc. long.

In open woods, especially along paths, Asheville, N.C. Aug. 1901.

The mealy Amanita is a very dainty species and seems to be generally distributed through the Appalachian region. We find it quite plentiful at Asheville, and in West Virginia it was found in even greater abundance. The pileus is at first nearly sub-globose, and cov-

PLATE 2.

AMANITA STRANGULATA.

ered with the gray mealy substance which is characteristic of the species. As it develops the pileus expands, and is for a time beautifully appendiculate with the particles which finally fall away. It is well illustrated by Atkinson (fig. 78, p. 76).

AMANITA STRANGULATA.

Pileus 1–3 in. broad, campanulate, becoming expanded and plane or depressed, brown or gray-brown, deeply striate on the margin, warty, slightly viscid when moist; stipe tapering upward, slightly enlarged at the base, whitish; lamellae not crowded, white, free; volva not membranous, firm in texture, breaking up into broad, felty scales on the pileus and forming a more or less perfect ring which remains adnate to the stipe near the base, like an annulus. Spores globose, 10–12 mc. in diameter.

Growing in damp woods, Brookside, W. Va., Aug. 1900.

The figure shows the peculiar features of this species, better than they can be described. It will be noted upon comparing this figure with the excellent representation published by Peck, (51st Report,) that the two differ in some particulars. Peck's figure agrees with that given in Cooke's illustrations of British Fungi (Plate 13) in having the volva slight, and persistent at the base of the stipe in "a few transverse fragments which are often so arranged as to form an incomplete ring or collar."

In our plant the volva is firm with a felt-like structure. The fragments on the pileus are firm and persistent, while those at the base of the stipe form a firm ring, which often projects ¾ in. from the stipe, and might appropriately be called a "false annulus." In this regard it answers well Fries's description, though it is not well shown in his figure.

The species seems to be rare, though in the mountains of West Virginia it is fairly abundant.

AMANITA PUBESCENS.

This species is included in our key to the sub-genus Amanitopsis, as it was originally found in North Carolina, though as far as we know it has not been detected since Schweinitz's day. If found its small size, yellow color, and pubescent pileus should at once distinguish it.

AMANITA NIVALIS.

Pileus white or nearly so, ovate, then expanded, deeply striate on the margin; lamellae free, white; stipe white, slightly bulbous, sheathed below with the fragile volva. Spores globose, 7–10 mc. in diameter.

We have followed Peck in referring this plant to A. nivalis. It is clearly identical with the New York plant, but our scanty material was not sufficient for satisfactory study and unfortunately no photograph was secured. It is our hope that it may be found in greater

PLATE 3.

AMANITA MUSCARIA VAR. COCCINEA.

abundance during the coming season and that characteristic photographs be made. As we find it, it is not far from A. vaginata.

AMANITA MUSCARIA VAR. COCCINEA.

Pileus ovate or nearly hemispherical, then campanulate, becoming plane or centrally depressed, bright red fading with age, thickly covered with the corky remains of the volva, soon becoming smooth, viscid : lamellae free, distinctly yellow, yellow pulverulent on the margin ; stipe slender, tapering upward, floccose; volva friable soon disappearing ; annulus lacking. Spores 9–11 by 6–7 mc.

Growing in clay soil, common.

This is in some ways the most attractive Amanita of this region. It was found repeatedly at Asheville, and was so abundant and constant in its characters that it seemed best to describe it as a distinct variety. The fact that several species of Amanita are occasionally found with no annulus, and that the pulverulent coating on the margin of the lamellae is doubtless the rudiment of that structure, has led us to consider it simply a well marked variety of A. muscaria, to which its close relationship is apparent, but it is felt that its separation as a variety will be a convenience to such mycologists as shall find it in their territory. It is possible that it may prove to be Fries's A. gemmata, though it does not agree perfectly with his description.

PUFF BALL LETTERS. No. 1.

KEW, ENGLAND,
January, 1904.

It has been almost a year now since I have been in Europe and in the meantime I have not been able to issue "Mycological Notes." It has not been possible for me to prepare away from home, the photographic illustrations which are the feature of the publication. These letters I shall hope to issue frequently, but they are not intended to take the place of "Mycological Notes," which will be published in future as circumstances will permit. I have received at Paris more than 500 "puff-balls" from correspondents in all parts of the world, of course only a few of the most noteworthy can be considered in these letters.

I beg to thank the following who reside in "Foreign Countries" for specimens. The contributions from Europe and America will be duly acknowledged in following letters.

R. T. Baker, Sydney, Australia.
Robt. M. Laing, New Zealand.
W. Jekyll, Jamaica.
J. Medley Wood, Natal, S. Africa.
W. G. Freeman, Barbados.
L. J. K. Brace, Bahamas.
E. Stuart Panton, Jamaica.
Kingo Miyabe, Sapporo, Japan.
Robert Brown, New Zealand.
Wm. Lunt, St. Kitts, W. I.
Walter Gill, Adelaide, Australia.
L. Trabut, Algiers.
W. W. Watts, Sydney, Australia.
H. F. Macmillan, Peradeniya, Ceylon.
J. G. O. Tepper, Australia.
Dr. M. M. Solerzano, Mexico.
W. R. Guilfoyle, Australia.
G. H. Cave. British India.
J. T. Paul, Grantville, Australia.
Botanic Gardens, Saharanpur, India.
Dr. Florentino Fellippone, Chilli.
T. Yoshinaga, Kochi, Japan.
Donor unknown, Brazil.
Kurt Dinter, German West Africa.
Miss B. Stoneman, South Africa.
Miss Jessie Dunn, New Zealand.

From far away Asia we have received a large specimen from **Geo. H. Cave,** British India and the same from **Hugh F. Macmillan** Ceylon. This is the "giant puff-ball" of India, **Lasiosphaera Fenzlii,** characterized by its large size and caducous peridium, which falls away when the plant matures, leaving a compact spore mass. Over 40 years ago such a specimen was collected on the voyage around the world of the "Novara," named and deposited in the Museum at Vienna. The peridium characters were unknown. Not another specimen has in the meantime been received in Europe, and the plant is not in the collections.

at Paris, London or Berlin. Thanks to the gentlemen who have sent us perfect specimens we can now give a good illustration of it.

An unknown donor of Brazil sends us a very similar plant **Lasiosphaera Argentina** (which was "described" as "Lanopila? Argentina.") This plant is very similar to the plant of India, same capillitium, spores a very little smaller, and thin peridium evidently caducous. The main difference is in the color of the gleba, which in the South American plant is lighter color. Perhaps, however, that is due to age. The genus Lasiosphaera is, I think, only known from these two countries.

The common large puff-ball of Europe and America reaches me from **Robert Brown, New Zealand.** This species **Calvatia gigantea**, known as the "giant puff-ball," has received many specific names (Bovista, maxima, &c.) It grows over a wide range in Europe, America, and Australia, and is the plant frequently mentioned on account of its enormous size. It has bright yellow gleba and globose spores.

A very similar plant, excepting that the spores are not globose but slightly oval or piriform, reaches me from **J. G. O., Tepper, Australia**, and **Mrs. Blanch Trask, Catalina Island** (near California mainland). I consider it a form, but those who do not permit the slightest variation in shape of spores must consider it a species. **Calvatia primitiva** would be a suitable name, as it has only reached me from countries noted for the primitive forms, both in the vegetable and animal kingdoms. I conceive (though it is merely a supposition) that this may be the progenitor of the widely distributed globose-spored plant Calvatia gigantea. I think the plant has never been formally "described," though it was mentioned by Léveillé more than sixty years ago.

Another plant I think undescribed reaches me from **Edward M. Erhhorn, Montain View, California.** It is globose, has no sterile base, but is much smaller than the previous species. I have labeled it **Calvatia umbrina,** and if I do not find it in some of the collections of Europe, I will illustrate it in "Mycological Notes" under this name. Peridium very thin, smooth, dark brown, almost black. It reminds me somewhat of the peridium of Bovista Pila, but dehisces evidently as a Calvatia. Gleba without sterile base, dark umber color, without tint of purple. Capillitium branching and intertwined, smooth, deeply colored, 4-6 mic. thick, thicker than the diameter of the spores. Spores small, about 4 mic. in diameter, globose, smooth, apiculate. The exact generic place of this plant is not assured as yet. It is close to "Calvatia hesperia," from the same region in form, size internal characters and absence of sterile base. It differs entirely, however, in the color of the gleba.

J. Medley Wood sends me a young specimen of **Podaxon carcinomalis.** This was one of the first species of the genus known. It grows principally on the ant-hills of South Africa and is undoubtedly one of the plants the mycelium of which is "cultivated" by ants. Thunberg, who first brought the plant to Europe 150 years ago states that at that time the powder was used by the natives as a dressing for scrofulous sores. The plant reached me under the name Podaxon pistillaris, but that species (of India) I think is different.

Some beautiful specimens of **Phellorina Delestrei** are received from **Dr. X. Gillot, Autumn, France.** This genus of North Africa we have

had in imperfect material for some time, but now only, thanks to Dr. Gillot, are we enabled to prepare illustrations of it. It is not characteristically figured usually.

L. J. K. Brace, Bahamas, favors us with an additional and very liberal collection of **Diplocystis Wrightii** already illustrated from his specimens in Mycological Notes.

Kingo Miyabe, Japan, sends a **Bovistella** we believe unnamed. The only species it approximates is Bovistella ammophila of France, and the only material in the Museums of the latter plant is so fragmentary it is difficult to decide.

Wm. Lunt, Saint Kitts, W.I., sent a very liberal collection of **Bovista bicolor**. This species, originally from Ceylon, seems to be the usual species in the warm countries. We know it now from India, West Indies and Mexico. The capillitium is not like the typical capillitium of the genus, being longer threads and more intertwined, but whether it is policy to take it out of the genus Bovista and call it Lanopila on this account alone, as has been suggested, does not seem to me assured.

Mrs. Blanch Trask, Catalina Island, sends **Geaster fornicatus,** which is the second time the plant has been collected in the U.S. Plants, so called (erroneously) are not of rare record, but the true species is only known from Catalina Island and Texas.

A species of **Phellorina** comes from **P. B. Kennedy, Nevada.** The genus Phellorina undoubtedly occurs in the U.S., but we know nothing as to the species. The weathered remnant "described" as Phellorina Californica should never have been determined, much less described. Mature specimens from W. H. Long, Texas, are in the Museum at New York, and in addition we have this (young) specimen from Mr. Kennedy. We are acquainted with all this material and in addition we have also a good knowledge of Phellorina Delestrei from North Africa, but whether they are the same or different species we would not wish to say.

We were glad to receive some nicely dried specimens of **Secotium erythrocephalum** from **Robert Brown, New Zealand.** This, the red species, is the most frequent Secotium that grows in Australia and New Zealand, judging from the specimens I have seen in Europe, It is bright red when fresh. A recent writer states that it is the young condition of Secotium acuminatum, but there is not the slightest truth in the statement.

An interesting collection has been received from **Dr. M. M. Solerzano, Mexico,** but they are not fully identified as yet.

Mr. R. T. Baker, New South Wales, sends several interesting species. **Geaster biplicatus,** a species that has never been illustrated. It is close to Geaster pectinatus and differs only in having a definite area marked with plications at base of peridium. Originally described from Island of Bonin, I have seen specimens from Ceylon, New Guinea, and Australia.

J. T. Paul, Australia, sends a **Bovistella** unknown in that genus, though I will probably find it when I work up the "Lycoperdons" from Australia in the collection at Kew. Though the genus Bovistella is very distinct from Lycoperdon, none of the English botanists have ever distinguished it.

Dr. Florentino Fellippone, Montevideo, sends some sterile bases of **Calvatia cyathiformis** not of special interest in themselves, but of great interest to me as they enable me to demonstrate that "**Hippoperdon Pila,**" described as a perfect plant from this region, is nothing but these sterile bases.

T. Yoshinaga, Japan, favors me with **Mitremyces Ravenelii** exactly as it grows in the United States. The discovery of this plant in Japan is of great interest. Not only is it I think the first Mitremyces recorded from Japan, but it is the first known species of Asia with oval spores. All the species of India of this curious genus have globose spores. We were interested in examining some green spots that occurred on these specimens. They proved to be a little green alga. (As there have been "green" species of Mitremyces described, we thought perhaps it might be due to this same cause. In that we find we were mistaken, for "Mitremyces viridis" is not as green as it is painted, in fact we cannot see any marked difference in color between the dried specimens and those of Mitremyces Junghuhnii, which species we believe it to be.)

Mr. R. T. Baker, Sydney, Australia, favours us with two beautiful specimens of **Podaxon Aegyptiacus** which have been photographed and will appear in "Mycological Notes." This unique little species is the smallest of the genus, and this is the first time it has been recorded from Australia. It belongs to the series with dark red spores. A fragmentary specimen of the same from Sutton river, Australia, is found in Berkeley's collection which he had determined as Podaxon pistillaris, a species of India belonging to the olive spored series. In the "Australian Fungi," it appears as Podaxon indicus, which is purely a juggled name based on two mistakes. Podaxon Aegyptiacus, originally known from North Africa is now recorded from German West Africa and Australia.

Mr. R. T. Baker also sends **Catastoma anomalum,** to me a most welcome addition to this little known genus. It was described as Bovista anomala, and its name indicates unfamiliarity with the genus to which it belongs. It is an "anomalous" Bovista, in fact not a Bovista at all, but a very natural Catastoma. In transferring it to this genus, it should be given another name. It is a most unique little species, with a very thin exoperidium, a chocolate brown endoperidium, and a raised mouth something like the mouth of certain Tylostomas. Internally it has typically the structure of the genus Catastoma.

Mr. Geo. H. Cave, British India sends ***Scleroderma columnare,*** a species quite distinct from those that occur in Europe and America. This plant has normally a long stalk, and on this account it has been claimed to belong to a separate genus, Areolaria. The specimens that Mr. Cave sends prove that "the stalk" is not of generic, nor even specific value, for while most of the specimens are stalked, some of them are entirely sessile.

C. G. LLOYD.

107, Boulevard St. Michel,
Paris, France.

PUFF BALL LETTERS. No 2.

PARIS, FRANCE; MAY, 1904.

This letter, written at Paris, will be mailed from America as soon as I reach home. I have now spent fourteen months in the museums of Europe studying the "type specimens" of the "puff balls", and I feel as well informed on the subject as it is possible for one to be from the scanty, often imperfect, material from which the work has been done I believe that the ' puff balls" of the world are very little known, and consider my fourteen months as only preparatory to a better knowledge from material that my correspondents send me. I hope to enlist the aid of every man who receives these letters on the subject. It is such a simple matter to pick up "puff balls", and so easy to send them, that no one need hesitate on account of the trouble. My permanent address is **107 Boulevard St. Michel, Paris, France,** where all packages will reach me. I shall return to Paris in a few months, and hope to find awaiting me a package of puff balls from you. I beg to thank the following gentlemen who have kindly favored me since my recent letter.

Rev. Johann Rick, S. J. sends from **Brazil** an interesting collection. **Protubera Maracuja, "Michenera Rompelii, Rick, n. s."** and **"Geaster violaceus, Rick, n. s."** are all new to me. The latter is unique among Geasters being a bright violet color and the only species I have ever seen distinguished by a distinctive color. "Polysaccum pisocarpium ad lignum" I doubt. It is quite young, and the spores hyaline. It is something new I think. **Geaster Englerianus,** a species close to saccatus but with a very *black* endoperidium. **Geaster saccatus,** several small forms. **Geaster** (I think unnamed) with a black, sessile, endoperidium, sulcate mouth and recurved endoperidium. It approaches nanus but has no pedicel. It is also close to recurved forms of elegans, but in my mind the black endoperidium removes it from elegans which belongs to the reddish series and is usually saccate. **Lycoperdon epixylon,** but growing on manure, same I think as **Lycoperdon confluens** of Guadeloupe. This species with Lycoperdon fuligineum and Lycoperdon velutinum which are all closely related, if not forms of the same species, form a very natural section of the genus characterized by the hyaline capillitium, small but *very rough* spores and habits different from other Lycoperdons. Lycoperdon tephrum is a related plant with similar habits but it has smooth spores. **Bovista bicolor** (or perhaps better **Lanopila bicolor**) which seems to be a common species in warm countries. We know it now from India, Africa, West Indies, Mexico and Brazil. It is the plant referred to in our Letter No. 1 as "Lasiosphaera Argentina", but we feel sure now it does not does not belong to the genus Lasiosphaera. It is hard usage in the mails and not nature that makes the peridia of the specimens we have received caducous. Lanopila guaranitica (not L Argentina as inadvertently printed in Letter No. 1), authentic specimen in the museum at Paris is the same plant. Also the specimen collected by Gaudichaud in Brazil, 1831 and determined by Montagne as "Lycoperdon Bovista" is the same plant ; also the plant from Mexico mentioned on page 118 of Mycological Notes and Plate 4 as "Bovista lateritia" is the same species. "Bovista pannosa", "Bovista tosta" and "Bovista argentea" (the latter as to specimens now preserved as representing the type but not the plant described I think) are all the same plant.

L. Damazio, Brazil, sends **Calvatia lilacina,** a frequent plant of world wide distribution. I was also glad to get from him a nice collection of **Lycoperdon oblongisporum** which I had previously received from no one. It is the only Lycoperdon known with *truly oblong* spores. We have in the United States a very similar species with spores not round but oval which has been determined as L. oblongisporum, but I am satisfied since seeing the particular spores of L. oblongisporum in the herbarium at Kew that it is different from our plant. The true species is known only from the West Indies and Brazil.

R. L. Proudlock, British India, favors us with a fine collection of **Scleroderma aurantium,** just as it grows both in Europe and America. It is a common plant but these are unusually fine specimens. If we could interest the botanists generally in British India to gather and send us the "puff balls" they find in the quantity and condition that Mr. Proudlock sends these we would then be in position to issue an illustrated pamphlet on the subject which would enable the botanists of British India to determine readily the species as they find them.

Wm. Gollan, British India, also sends us **Geaster hygrometricus.** We have seen no specimens of this plant from Australia, but with this exception we have noted collections from almost the world entire.

W. R. Guilfoyle, Australia, favors us with a fine specimen of **Mycenastrum Corium** and with **Geaster saccatus.** Mycenastrum corium is a common plant in Australia and the only species known to grow there. Both the species "described" from that country we are assured from examination of the types are only conditions of it.

F. M. Reader, Australia also sends **Mycenastrum corium, Phellorina australe, Lycoperdon** close to dermoxantha and a **Lycoperdon** which we shall call **L. nigrum.** We are particularly glad to get Phellorina australe, this being the first specimen we have received and the only *good specimen* we have seen. The "type" is little more than an empty old peridium. **Lycoperdon nigrum** can perhaps be best described as a black form of Lycoperdon polymorphum with the same spores, capillitium and compact sterile base; it differs only in the notably black peridium. We shall consider it as a black form or subspecies of L. polymorphum.

H. F. McMillan, Ceylon, favors us with a specimen of Calvatia Gardneri, described (1875) as Lycoperdon Gardneri from a specimen from the same locality. In studying the Calvatias of India, all of which were described as Lycoperdons (viz: Lycoperdon Gardneri, Lycoperdon sericellum and Lycoperdon crassum) we are impressed with two facts. All have a reddish tinge to the gleba, and the spores of all are not perfectly round but slightly elliptical. We think all are virtually the same plant, though differing in habits. One specimen (that we take also to be the same) has the gleba so red that we find it classed as "Bovista bicolor", a species not otherwise related but noted for the reddish color of its gleba.

J. G. O. Tepper, Australia, sends us we think, a bleached specimen of Geaster Schmidelii; Geaster minimus, typically as we have it in America; Mycenastrum corium; Tylostomas scanty and doubtful; and a very interesting little Calvatia which we at first thought was undescribed. We have since learned the rare plant of Europe, Calvatia candida, which is so close that we shall want to make a comparative study before deciding.

C. G. LLOYD,

107 Boulevard St. Michel, - - PARIS, FRANCE.

PUFF BALL LETTER No. 3.

Cincinnati, July 1904.

ACKNOWLEDGMENT OF SPECIMENS RECEIVED FROM UNITED STATES AND CANADA.

The following persons who have kindly sent us specimens since our last acknowledgment, will be continued on the mailing list of Mycological Notes. The publication is issued principally with the object of interesting collectors to pick up specimens and send them to our museum and we cannot agree to continue the publication to those who do not take this interest in the work. In the past we have asked solely for "Puff-Balls" but we will be glad now to accumulate material in other families. Anything of a firm texture, that preserves its characters when dry, such as Polyporaceae, Thelephoraceae, Hydnaceae, etc. will be gladly received. We cannot offer to name these specimens, for outside of the Gastromycetes, we have only a superficial knowledge of the subject. Material received will be sorted, labeled and preserved in our Museum, and if we never study it critically, the material will be in good form and somebody else some day will probably do so.

But we want suitable material for study. It is an easy task to take a basket, and pick up sticks that have fungi growing on them, and to cut off the hard fungi from logs, etc. We ask however, that our friends do *not* send us dried specimens of the fleshy agarics, etc. or of fleshy fungi in general.

A few families such as Helvellas, Morchellas, Geoglossums, etc. which have peculiar shapes and spores and can be studied from dried specimens we will be glad to receive if carefully dried, but the great family of fleshy agarics, Clavarias, etc. are of no use to us when dried.

In the following list we have omitted a number of Lycoperdons and Tylostomas which families have not been well worked up as yet. We hope however, to make a thorough study and publication during the present summer of the large material which has accumulated.

LIST OF SPECIMENS RECEIVED FROM THE UNITED STATES AND CANADA SINCE LAST REPORT.

D. A. BALDWIN, South Hancock, Maine:—Lycoperdon gemmatum, Lycoperdon cruciatum.

D. D. BALDWIN, Hawaii:—Trametes Persoonii, Lepiota cepaestipes, Scleroderma verrucosum.

J. M. BATES, Callaway, Neb.:—Tylostoma poculatum (type), Tylostoma campestre, Tylostoma subfuscum, Catastoma subterraneaum, Polyporus adustus, Geaster Drummondii.

A. S. BERTOLET, Spring Hill, Ala:—Polysaccum crassipes, Scleroderma flavidum, Tylostoma mammosum, Geaster saccatus, Geaster saccatus, var. major, Polystictus Schweinitzii, Hydnangium Ravenelii, Mitremyces cinnabarinus, Cauloglossum transversarium (fine lot).

A. S. BERTOLET, Sarnia, Ontario:—Secotium acuminatum, Geaster triplex, Geaster saccatus, Bovista pila, Bovista plumbea.

HUGO BILGRAM, Philadelphia, Pa.:—Lycoperdon subincarnatum, Lycoperdon pyriforme, Lycoperdon gemmatum, Geaster velutinus, Scleroderma cepa.

W. C. BLASDALE, Berkeley, Cal.:—Calvatia sculptum.

E. E. BOGUE, Agricultural College, Mich.:—Lycoperdon pyriforme, Cyathus vernicosus.

M. G. BOHN, Miamisburg, O.:—Lycoperdon gemmatum, Calvatia lilacina, Calvatia craniiformis.

F. J. BRAENDLE, Washington, D. C.:—Discina reticulata, Urnula craterium.

DR. WM. T. BRIGHAM Hawaii.:—Lycoperdon gemmatum.

C. E. BROWN, Milwaukee, Wis.:— Mycenastrum Corium, Scleroderma cepa, Scleroderma aurantium, Lycoperdon echinatum, Lycoperdon pulcherrimum, Geaster triplex.

CAROLINE A. BURGIN, Philadelphia, Pa.:—Geaster asper, Geaster minimus, Scleroderma Geaster, Polysaccum pisocarpium.

PEARSON BURKE, Auburn, Ala..—Tylostoma (Sp.)

E. V. BURKE, San Francisco Cal.:—Helvella Californica, (fine lot).

HENRY M. CALDWELL, Rugby, Tenn.:—Geaster hygrometricus, Lycoperdon gemmatum, Mitremyces lutescens, Lycoperdon pyriforme, Catastoma circumscissum, Rhizopogon rubescens, Bovistella Ohiensis, Mitremyces Ravenelii, Scleroderma flavidum, Scleroderma Geaster, Geaster rufescens.

DR. N. S. DAVIS, Mississippi:—Daedalia unicolor, Daedalea cinnamomea, Lentodium squamosum, Polyporus gilvus.

S. S. DAVIS, Falmouth, Mass.:—Scleroderma Geaster, Scleroderma vernicosum, Scleroderma cepa, Bovista plumbea, Lycoperdon Wrightii.

MRS. DALLAS, Philadelphia, Pa.:—Geaster hygrometricus.

J. DEARNESS, London, Ontario.:—Geaster pectinatus, Geaster saccatus, Geaster limbatus, Scleroderma tenerum, Lycoperdon pedicellatum, Bovista plumbea, Lycoperdon gemmatum, Secotium acuminatum, Lycoperdon pyriforme, Lycoperdon polymorphum, Scleroderma aurantium, Geaster mammosus, Geaster minimus, Geaster Schmidelii, Geaster rufescens, Geaster triplex, Geaster coronatus, Lycoperdon cruciatum, Polyporus Berkeleyi.

C. H. DEMETRIO, Emma, Mo.:—Geaster saccatus, Geaster caespitosus.

R. H. DENNISTON, Madison, Wis.:—Lycoperdon pulcherrimum, Lycoperdon pedicellatum, Geaster hygrometricus, Scleroderma bovista, Lycoperdon pyriforme, Mycenastrum corium, Lycoperdon pyriforme, Calvatia lilacina, Lycoperdon gemmatum, Geaster rufescens, Scleroderma cepa, Bovista plumbea, Scleroderma tenerum, Boletus sphaerosporus, Bovista pila, Lycoperdon echinatum.

T. R. DONNELLY, Pleasant Fork, Assiniboia:—Calvatia caelata, Mycenastrum Corium.

H. B. DORNER. LaFayette, Ind.:—Calvatia lilacina, Tylostoma verrucosum, Calvatia rubro-flava, Lycoperdon pyriforme, Lycoperdon pyriforme var. tessellatum, Lycoperdon cruciatum, Bovista plumbea (oval spored form) Lycogala epidendrum, Lycoperdon pulcherrimum.

B M. DUGGAR, Columbus. Mo.:—Lycoperdon pyriforme, Lycoperdon gemmatum, Geaster rufescens, Geaster hygrometricus, Bovistella Ohiensis, Secotium acuminatum,

EDW. M EHRHORN, Mountain View, Cal.:—Cyathus vernicosus, Calvatia umbrina, Cochlearia aurantium, Bovista plumbea.

E. P. ELY, Monticelli, Minn.:—Bovista pila, Lycoperdon Wrightii, Lycoperdon gemmatum.

E. P. ELY, Woodbridge, Conn.:—Lycoperdon pusillum, Scleroderma vulgare.

EDWARD P. ELY, West Milan, N. H :—Lycoperdon gemmatum.

C. L. FISHER, St. Thomas, Ont. :—Catastoma (Sp.)

MAY FITZGERALD, Waynesville, N. C. :—Geaster hygrometricus, Geaster saccatus, Mitremyces Ravenelii, Cordyceps (Sp.)

JAMES FLETCHER, Ottawa, Canada:—Geaster rufescens, Thelephora laciniata, Lycoperdon pyriforme, Lycoperdon gemmatum, Secotium acuminatum, Mycenastrum Corium, Mycenastrum Corium form Sterlingii, Mutinus caninus, Geaster triplex.

JAMES FLETCHER, Grand Fork, Canada:—Mycenastrum Corium.

H. GARMAN, Lexington, Ky.:—Geaster hygrometricus, Secotium acuminatum.

N. M. GLATFELTER, St. Louis, Mo.:—Cyathus striatus.

Mrs. KATE W. GRAFTON, Union Church, Miss.:—Lycogala epidendrum.

L. A. GREATA, Los Angeles, Cal.:—Tylostoma campestris.

DAVIS GRIFFITHS, Arizona:—Geaster saccatus var. major.

M. E. HARD, Chillicothe, Ohio:—Secotium acuminatum, Lycoperdon pyriforme.

E. T. HARPER, Chicago, Ill.:—Trametes.

JOHN W. HARSHBERGER, Philadelphia, Pa.:—Lycoperdon gemmatum, Scleroderma Geaster, Scleroderma vulgare, Bovistella (Sp.) Geaster hygrometricus.

GEO. G. HEDGCOCK, St. Louis, Mo :—Lycoperdon pyriforme, Scleroderma vernicosum, (Texas).

A. J. HILL, New Westminister, B. C.:—Lycoperdon pyriforme, Bovista pila, Crucibulum vulgare and several interesting Nidulariaceae, Lycoperdon pyriforme var. excipuliforme, Lycoperdon gemmatum (yellow form).

T. C. Horton, Dallas, Texas:—Mycenastrum Corium, Bovistella Ohiensis.

David L. James, White Sulphur Springs, W. Va. :—Geaster hygrometricus, Bovista pila, Fomes leucophaeus, Polystictus cinnabarinus.

Chas. W. Jenks, Bedford, Mass.:—Lycoperdon Wrightii, Urnula Craterium.

H. P. Kelsey, Kawana, N. C. :—Bovista pila, Lycoperdon pyriforme, Scleroderma vulgare.

P. B. Kennedy, Reno, Nevada:—Polyporus volvatus, Phellorina (Sp), Mycenastrum Corium.

P. Lemay, St. Jean des Chaillons, Canada :—Bovista pila.

W. H. Long, Jr., Denton, Texas :—Secotium acuminatum, Calvàtia lilacina, Arachnion album, Scleroderma flavidum, Cyathus stercoreus, Cyathus stercoreus (sp. small), Polysaccum pisocarpium, Catastoma circumscissum, Lycoperdon cruciatum, Geaster hygrometricus, Mycenastrum Corium, Polysaccum pisocarpium, Bovistella Ohiensis, Calvatia rubroflava, Catastoma subterraneum, Lycoperdon pulcherrimum, Lycoperdon Wrightii, Calvatia craniiformis, Calvatia lilacina var. leprosum, Bovista pila, Lycoperdon gemmatum, Cyathus striatus, Lycoperdon subincarnatum, Lycoperdon echinatum, Cyathus vernicosus, Scleroderma vernicosum, Scleroderma vulgare, Geaster saccatus var. major, Geaster Bryantii, Geaster minimus, Geaster Schmidelii, Geaster saccatus, Geaster asper, Phellorina (sp.) Simblum flavescens (?) Gyrophragmium Texense, Catastoma (sp.) Montagnites Candolei, Phallus rubicundus, Geaster fornicatus, Phallus impudicus.

E. D. Lordly, Chester, Nova Scotia :—Calvatia lilacina.

R. B. Mackintosh, Peabody, Mass.:—Lycoperdon pyriforme, (yellow form), Lycoperdon gemmatum, Scleroderma cepa, Scleroderma vernicosum, Lycoperdon pyriforme, Lycoperdon Wrightii, Lycoperdon cruciatum, Geaster Morganii.

John Mac Swain, Charlottetown, P. E. I. :—Scleroderma cepa.

Jos. W. Marsh, Forest Grove, Oregon :—Bovista pila, Lycoperdon (sp.)

Chas. McIlvaine, Cambridge, Md.:—Bovistella Ohiensis.

C. E. Montgomery, Portsmouth, N. H. :—Cyathus stercoreus.

A. P. Morgan, Harrison, O.:—Calvatia craniiformis, Lycoperdon pulcherrimum.

G. E. Morris, Waltham, Mass.:—Lycoperdon pyriforme, Geaster saccatus, Scleroderma flavida, Scleroderma verrucosum, Bovista plumbea, Mitremyces cinnabarinum, Cordyceps militaris, Boletus parasiticus on Scleroderma, Geaster coronatus, Geaster hygrometricus, Crucibulum vulgare.

N. L. T. Nelson, Voss, Minn.:—Lycoperdon gemmatum.

J. J. Newbaker, Steelton, Pa.:—Morchella semilibera.

Mrs. M. A. Noble, Lake Helen, Fla.:—Lycoperdon cruciatum, Scleroderma tenerum, Polysaccum pisocarpium, Myriostoma coliformis, Scleroderma flavidum.

S. B. Parish, San Bernardino, Cal.:—Catostoma subterraneum.

Chas. Peck, Albany, N. Y.:—Calvatia pachyderma (type), Lycoperdon coloratum (type).

Mrs. M. S. Percival, Rugby, Tenn.:—Lenzites betulina, Polystictus hirsutus, Lycogala epidendrum, Rhizopogon rubescens, Polystictus versicolor, Stereum bicolor, Polystictus pergameus, Polystictus cinnabarinus, Polyporus adustus.

C. E. Please, Chipley, Fla.:—Calvatia lilacina, Catastoma circumscissum, Scleroderma Geaster, Bovistella Ohiensis, Geaster hygrometricus, Lycoperdon cruciatum? Cyathus (new to me), Scleroderma Bovista, Clathrus columnatus.

W. L. Poteat, Wake Forest, N. C.:—Bovistella Ohiensis, Geaster velutinus, Lycoperdon cruciatum.

F. R. Rathbun, Auburn, N. Y.:—Geaster rufescens, (fine specimens) Lycoperdon gemmatum, Hydnum repandum, Lycoperdon pyriforme.

S. L. Schumo, Natural Bridge, Va.:—Scleroderma tenerum, Geaster saccatus, Lycoperdon subincarnatum.

Miss Grace Sedgwick, Paw Paw Lake, Mich.:—Bovista pila.

Margaret L. Sewall, Washington, D. C.:—Calvatia craniiformis? Lycoperdon gemmatum, Lycoperdon cruciatum, Mitremyces lutescens, Lycogala epidendrum.

W. W. Stockberger, Granville, Ohio:—Tylostoma mammosum.

W. N. Suksdorf, Washington:—Tylostoma albicans, Polysaccum crassipes, Geaster minimus, Bovista plumbea, Bovistella dealbata, Lycoperdon polymorpha, Geaster saccatus form major, Geaster delicatus, Geaster delicatus (var. major?) Rhizopogon rubescens, Rhizopogon (several species).

Mrs. Blanche Trask, Catalina Island, Cal.:—Geaster hygrometricus var. giganteus, Geaster fornicatus. Catastoma subterraneum, Calvatia lilacina, Geaster limbatus, Calvatia pachyderma, Bovista plumbea, Geaster minimus, Geaster floriformis, Catastoma circumscissum.

Dr. H. L. True, McConnellsville, O.: - Clitocybe fumosa.

Susan Tucker, Cheney, Washington:—Geaster asper

F. J. Tyler, Virginia:—Mitremyces minor, Lycogala epidendrum, Lycoperdon gemmatum, Scleroderma Geaster, Geaster hygrometricus.

A. L. Voight, Detroit, Mich.:—Urnula Craterium.

Fred K. Vreeland, Hickory Gap, N. C.:—Bovistella Ohiensis, Geaster hygrometricus, Mitremyces lutescens, Lycoperdon pyriforme.

F. K. Vreeland, Smithfield, Va.;—Calvatia craniiformis.

F. K. Vreeland, New Orange, N. J.:—Lycoperdon gemmatum, Bovista pila.

W. H. Walmsley, Capon Springs, W. Va.:—Lycoperdon gemmatum, Lycoperdon cruciatnm, Scleroderma cepa.

H. E. Warner, Washington, D. C.: - Catastoma circumscissum, Cordyceps capitatus, Geaster minimus.

A. C. Wharton, Union Church, Miss.:—Urnula Craterium, Bovistella Ohiensis, Geaster rufescens.

T. N. Willing, Regnia, Assiniboia:—Mycenastrum Corium, Calvatia cælata, Cyathus (Sp.).

L. G. Yates, Santa Barbara, Cal.:—Phallus impudicus var. imperialis.

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PLATE 1

Fig. 1.

Fig. 2.

Fig. 3.

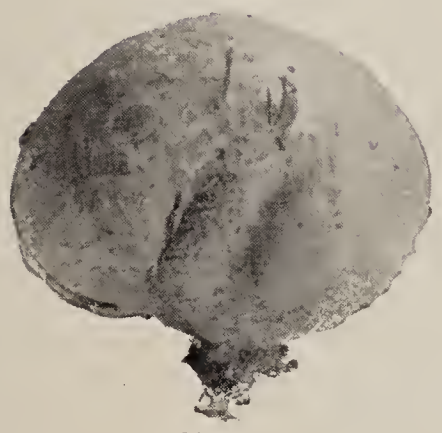

Fig. 4

Fig.5.

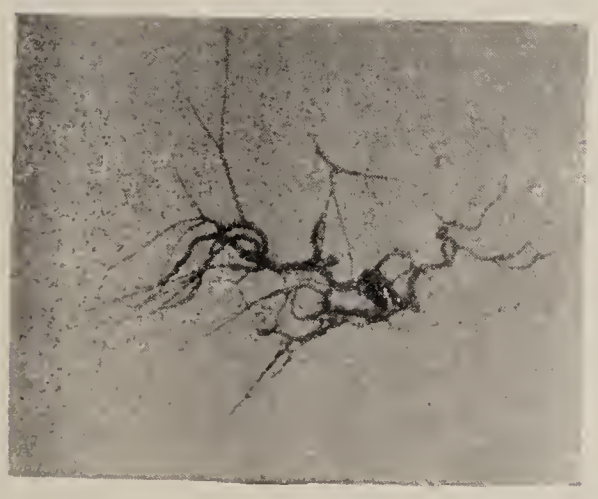

Fig. 6.

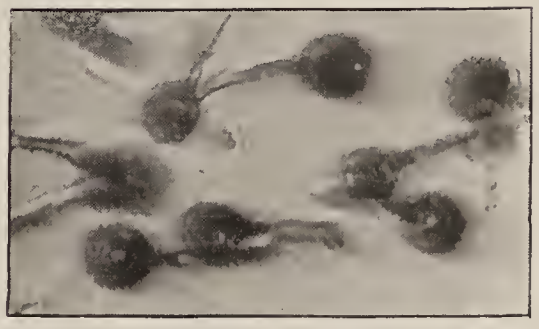

Fig. 7.

BOVISTA PLUMBEA.

(Explanation of figures, see over.)

Fig. 8.

Explanation of Figures.

Fig. 1. A mature plant. Fig. 2. Section of young plant. Fig. 3. A plant with scurfy particles of exoperidium. Fig. 4. A plant with exoperidium. Fig. 5. An unusually large plant, from C. V. Piper, Washington. Fig. 6. Capillitium (x 80). Fig. 7. Spores (x 1000). Fig. 8. Spores of oval-spored form (x 1000).

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PLATE 2.

Fig. 1.

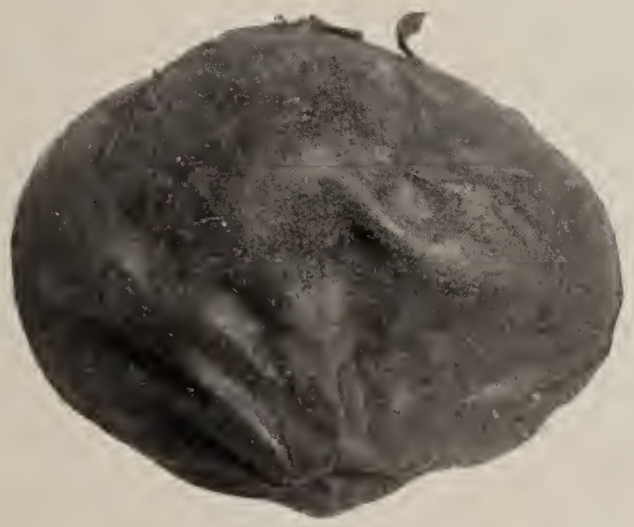

Fig. 2.

Fig. 3.

BOVISTA PILA.

(Explanation of figures, see over.)

Fig. 4.

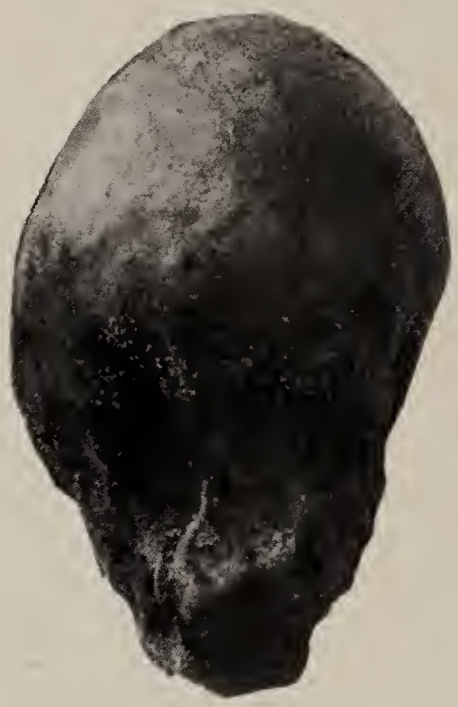

Fig. 5.

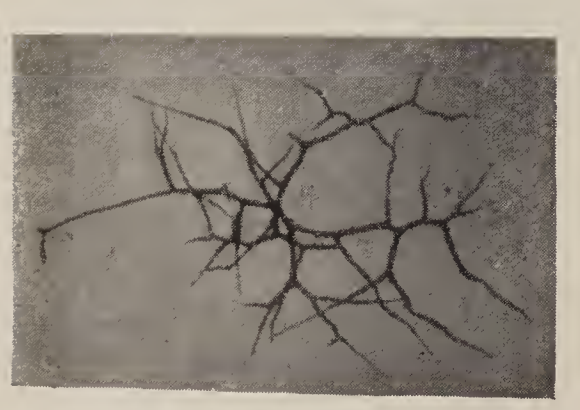

Fig. 6.

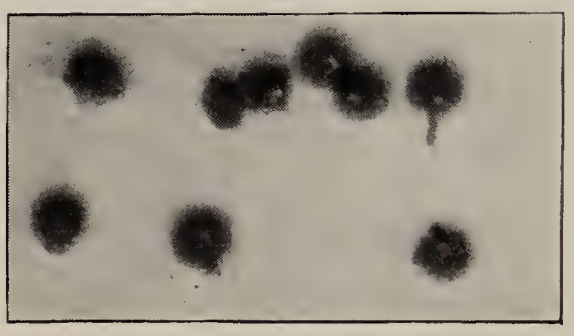

Fig. 7.

Explanation of Figures.

Figure 1 and 2. Mature plants. Fig. 3. Young plant with scurfy exoperidium. Fig. 4. Obovate form with plicate base from W. H. Aiken, Michigan. Fig. 5. Obovate form from F. K. Vreeland, Maine. Fig. 6. Capillitium (x 80). Fig. 7. Spores (x 1000).

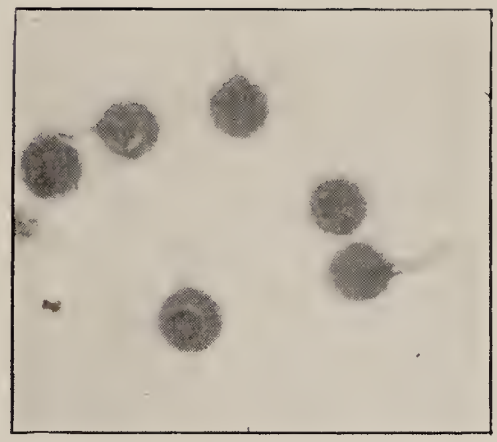

Fig. 1.

Fig. 2.

Explanation of Figures.

Fig. 1. Spores. (x 1000). Fig. 2. A mature specimen from Charles Crossland, England.

BOVISTA NIGRESCENS.

Fig. 3.

Fig. 4.

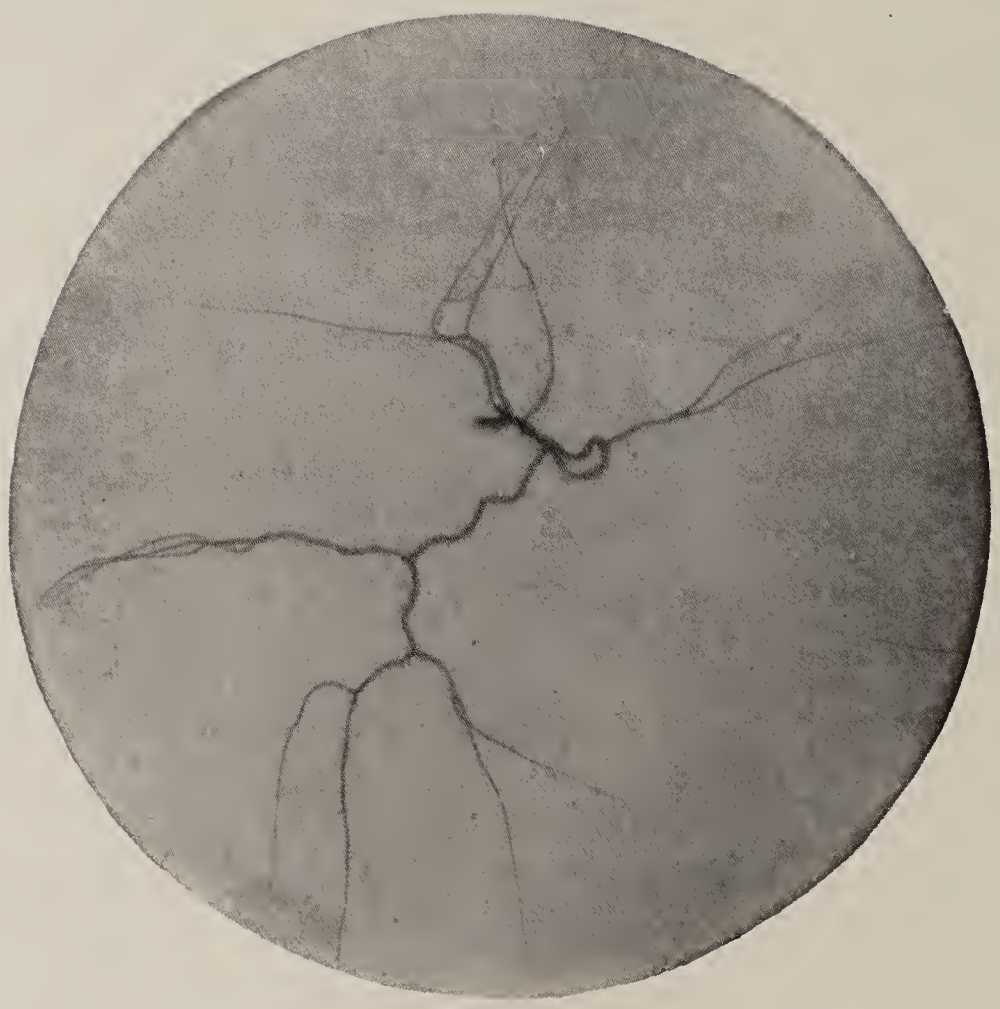

Fig. 5.

Explanation of Figures.

Fig. 3. A dried plant, type from A. P. Morgan, Ohio. Fig. 4. Spores (x 1000). Fig. 5. Capillitium (x 80).

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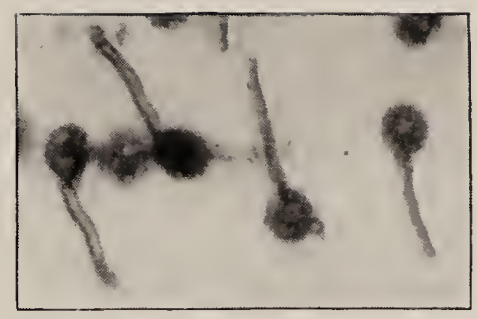
PLATE 4.

Fig. 1.



Flg. 2.

Fig. 3.

EXPLANATION OF FIGURES.

Fig. 1. Half, dried, pressed plant from Rev. G. Bresadola, Tirol. Fig. 2. Spores (x 1000). Fig. 3. Capillitium (x 80).

BOVISTA TOMENTOSA.

Fig. 4.

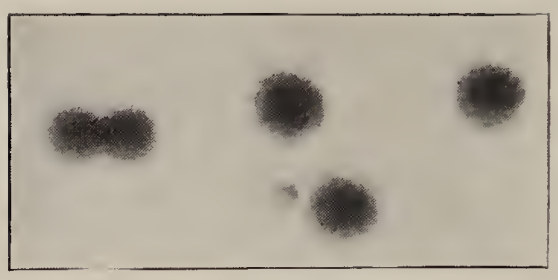


Fig. 5.

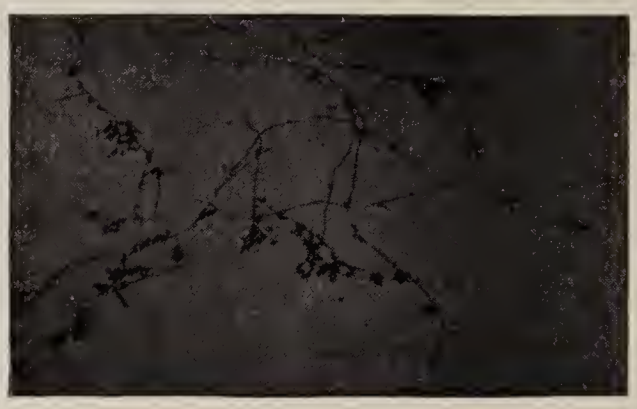


Fig. 6.

Explanation of Figures.

Fig. 4. A half section of plant from Mexico, given us by Prof. T. H. Macbride. Fig. 5. Spores (x 1000). Fig. 6. Capillitium (x 55).

BOVISTA LATERITIA.

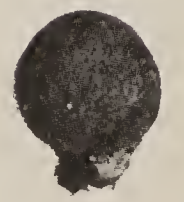


Fig. 7.

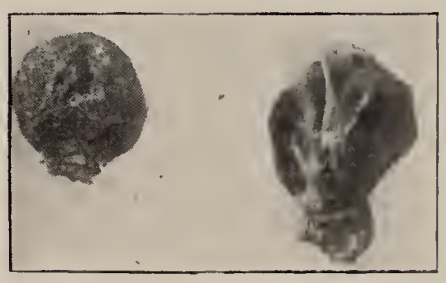


Fig. 8.

Explanation of Figures.

Fig. 7. A small plant (x 2½) to shown spiny nodules. Fig. 8. Old plants natural size. Specimens all from W. Jekyll, Jamaica.

BOVISTA ASPERA.

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PLATE 5.

Fig. 1.

MYCENASTRUM CORIUM.

Fig. 2.

Fig. 3.

MYCENASTRUM CORIUM.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

MYCENASTRUM CORIUM.

Fig. 10.

Fig. 11.

Explanation of Figures.

Fig. 1. A ripe plant from E. Bartholomew, Kansas. Fig. 2. A young plant showing felty cortex, from Dr. L. H. Watson, Chicago. Fig. 3. Section showing columellæ. Fig. 4 and 5. Obovate form from E. P. Ely, Texas. Fig. 6. Obovate form from Dr. Hollos, Hungary. Fig. 7. Specimen showing columellæ and method of dehiscence, from David Griffith, Nevada. Fig. 8. Capillitium (x 100). These spiny capillitium are characteristic of the genus. Fig. 9. Spores (x 1000). Fig. 10 and 11. Mycenastrum Corium form Sterlingii, from E. B. Sterling, Denver.

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PLATE 6.

Fig. 1.

Fig. 2.

Fig. 3.

CATASTOMA CIRCUMSCISSUM.

(Explanation of figures, see over.)

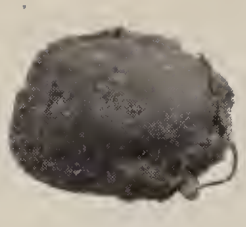

Fig. 4.

Fig. 5.

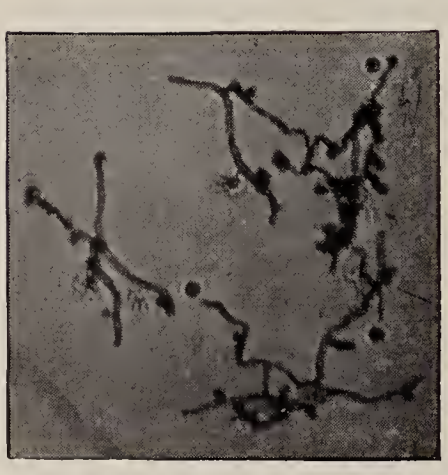

Fig. 6.

Fig. 7.

Explanation of Figures.

Fig. 1. Fresh plant as it grows half buried in the ground. Fig. 2, 3, 4 and 5. Dried plants natural size. Fig. 6. Capillitium threads (x 100). Fig. 7. Spores (x 1000).

CATASTOMA CIRCUMSCISSUM.

Issued by C. G. LLOYD.

PLATE 7.

Fig. 1.

Fig. 2.

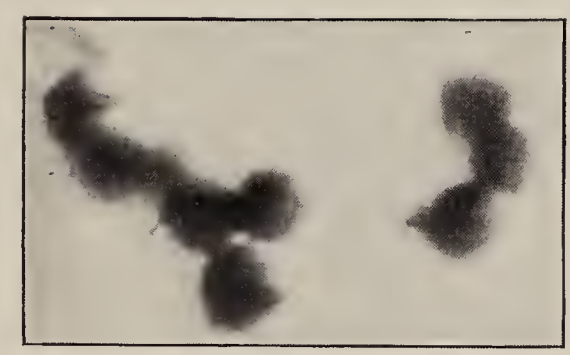

Fig. 3.

Explanation of Figures.

Fig. 1. A large plant, in the Ellis collection. Fig. 2. Specimen from E. Bartholomew, Kansas. Figure 3. Spores (x 1000).

CATASTOMA SUBTERRANEUM.

Fig. 4.

Fig. 5.

Eig. 6.

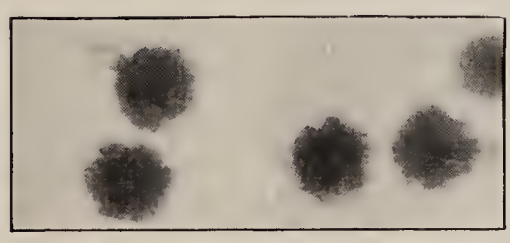

Fig. 7.

Explanation of Figures.

Fig. 4 and 5. Specimens from Mrs. Sams, Florida. Fig. 6. Specimens with the exoperidium attached. Fig. 7. Spores (x 1000).

CATASTOMA PEDICELLATUM.

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PLATE 8.

Fig. 1.

Fig. 2.

Fig. 3.

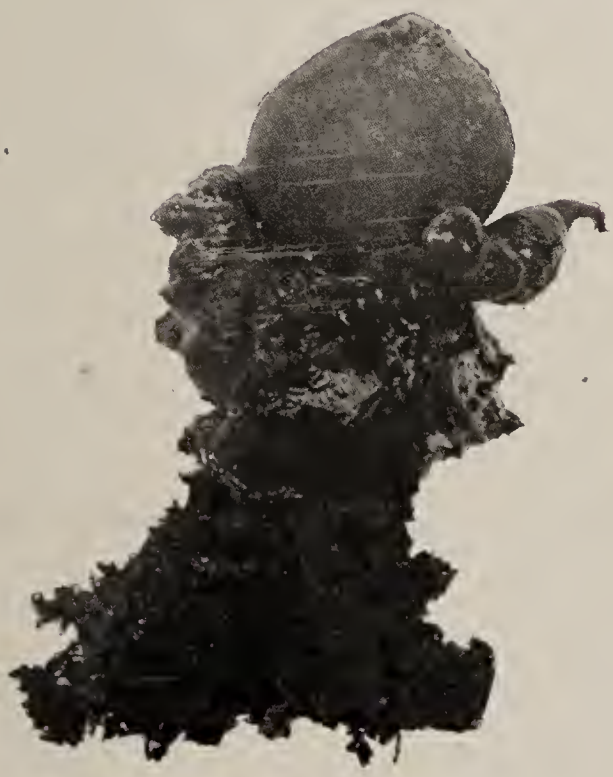

Fig. 4.

Fig. 5.

Fig. 6.

Explanation of Figures.

Fig. 1. A fresh plant with gelatinous exoperidium. Fig. 2. The exoperidium just beginning to "buckle." Fig. 3. The next stage. Fig. 4. The exoperidium mostly fallen off. Fig. 5. Section through fresh plant. Fig. 6. A plant dried with exoperidium.

MITREMYCES CINNABARINUS.

Fig. 7.

Fig. 8.

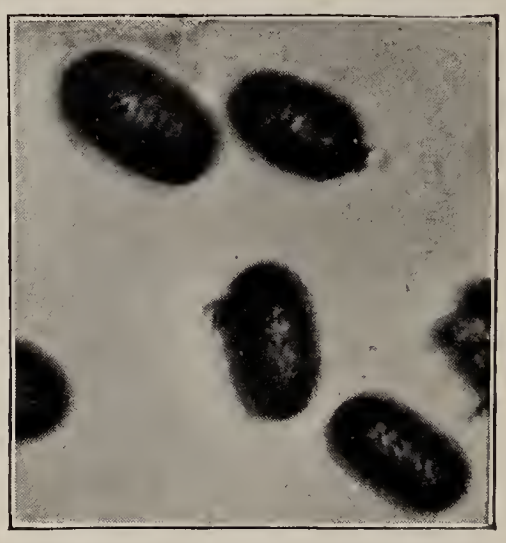

Fig. 9.

Fig. 10.

Explanation of Figures.

Fig. 7. Sections showing various stages of contraction of the spore sac. Photograph by H. C. Beardslee. Fig. 8. Spores (x 1000) plant from Hollis Webster, Massachusetts. Fig. 9. Spores (x 1000) plant from West Virginia. Fig. 10. A cluster of plants. Photograph by H. C. Beardslee.

MITREMYCES CINNABARINUS.

Issued by C. G. LLOYD.

PLATE 9.

Fig. 1.

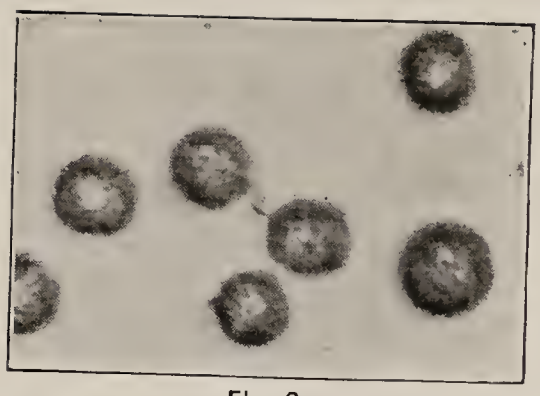

Fig. 2.

Fig. 3.

Explanation of Figures.

Fig. 1. A dried plant from F. J. Braendle, Washington, D. C. Fig. 2. Spores (x 1000). Fig. 3. A fragment of dried exoperidium that has fallen from over the mouth.

MITREMYCES LUTESCENS.

Fig. 4.

Fig. 5.

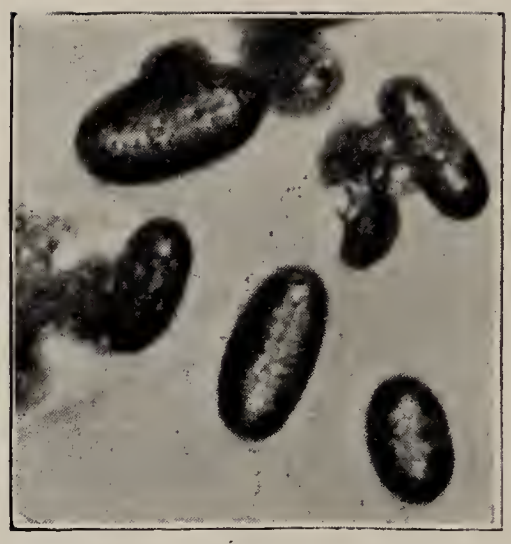

Fig. 6.

Explanation of Figures.

Fig. 4. Dried plants from F. J. Braendle, Washington, D. C. Fig. 5. Section of same. Fig. 6. Spores (x 1000.)

MITREMYCES RAVENELII.

Fig. 7.

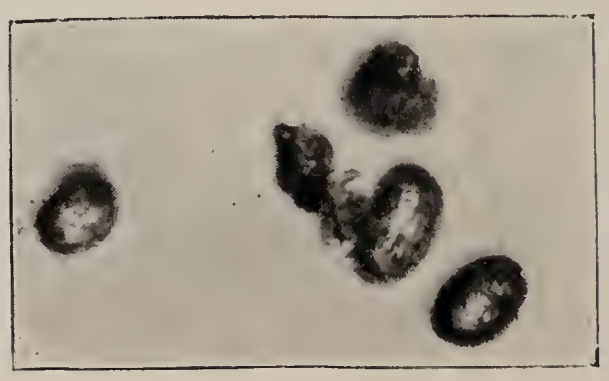

Fig. 8.

Explanation of Figures.

Fig. 7. Plants from F. J. Tyler, Virginia. Fig. 8. Spores (x 1000.)

MITREMYCES RAVENELII VAR. MINOR.

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PLATE 10.

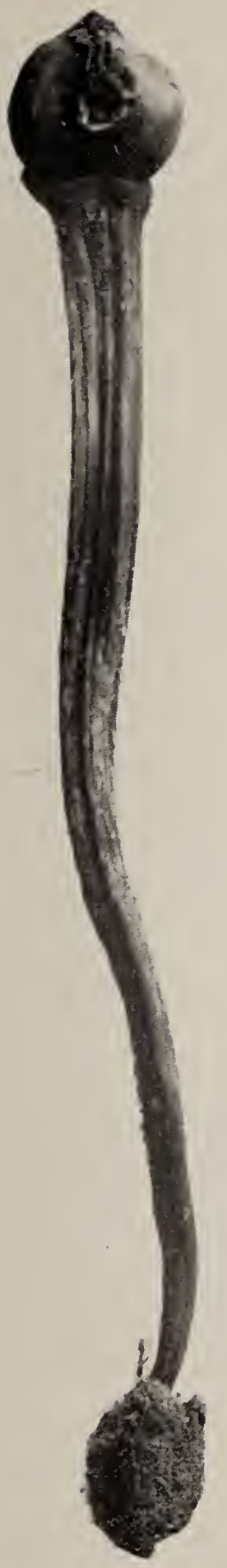


Fig. 1.

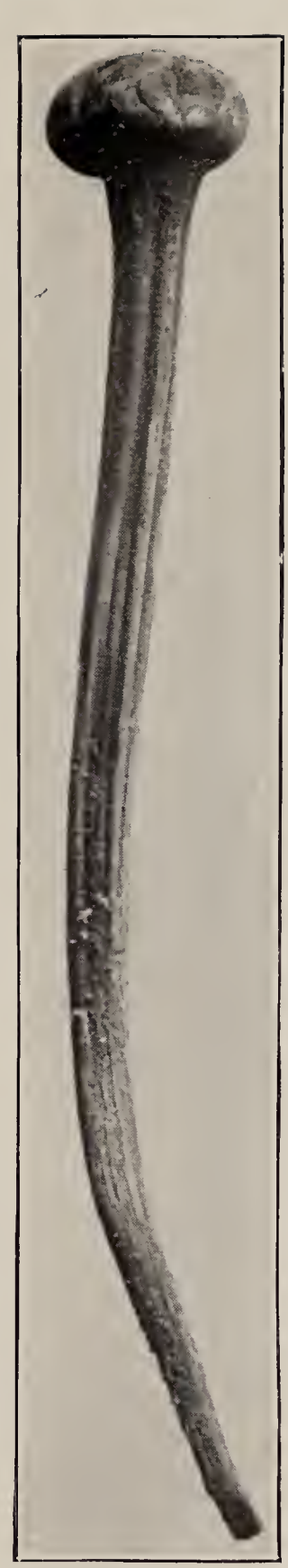


Fig. 2.

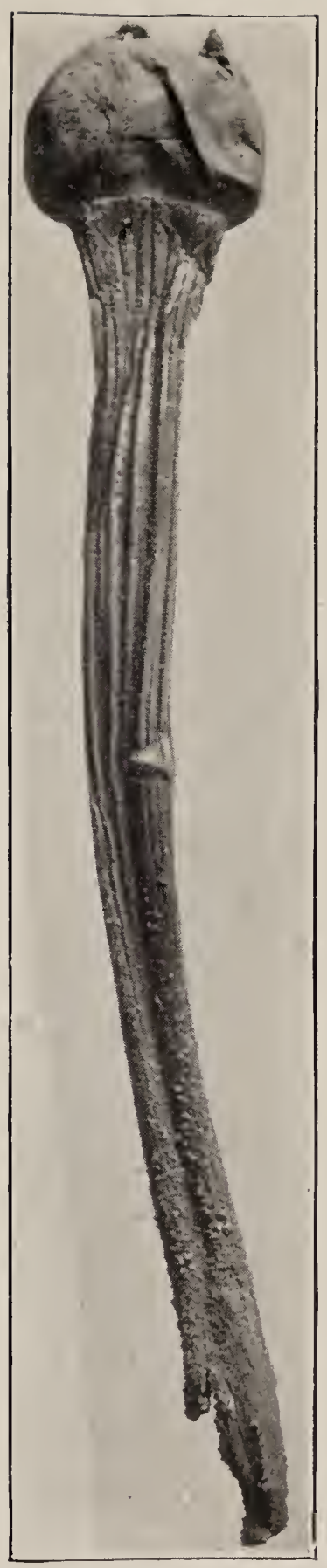


Fig. 3.

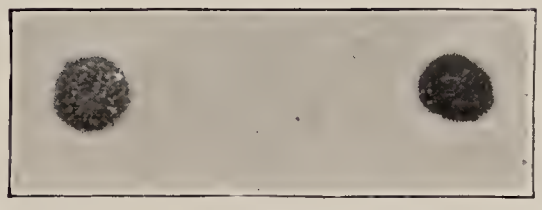


Fig. 4.

Explanation of Figures.

Fig. 1. Plant with volva. Figs. 2 and 3. Plant without volva. Fig. 4. Spores (x 1000.) All from C. V. Piper, Washington.

CHLAMYDOPUS MEYENIANUS.

Fig. 5.

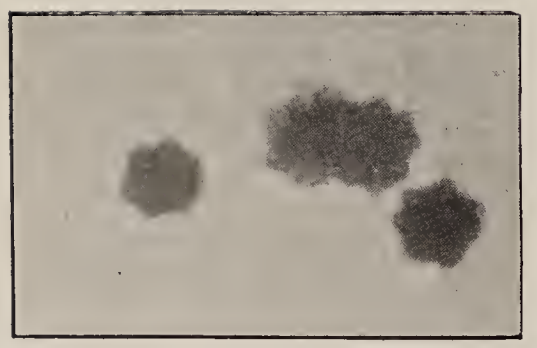


Fig. 6.

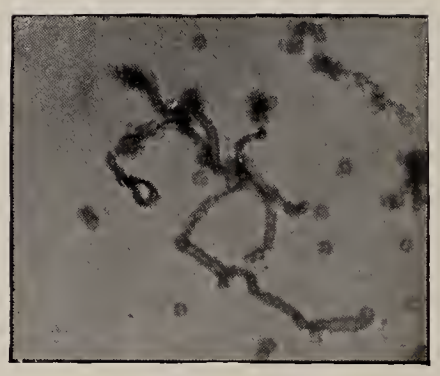


Fig. 7.

Explanation of Figures.

Fig. 5. Plant, natural size. Fig. 6. Spores (x 1000.) Fig. 7. Capillitium (x 55,) Specimens from Dr. Wm. Herbst, Trexlertown, Pa.

QUELETIA MIRABILIS.

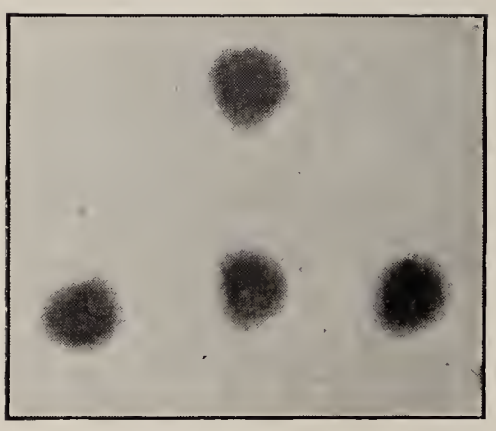
Issued by C. G. LLOYD.

PLATE 11.

Fig. 1.

DICTYOCEPHALOS CURVATUS.

(Explanation of figures, see over.)



(Fig. 2.)

Explanation of Figures.

Fig. 1. Plant (reduced one-third), in Ellis's collection, from E. Bethel, Colorado. Fig. 2. Spores (x 1000.)

DICTYOCEPHALOS CURVATUS.

Issued by C. G. LLOYD.

PLATE 12.

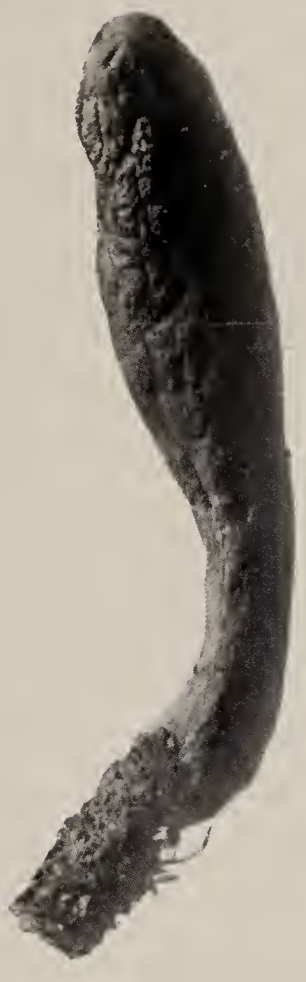


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

(Explanation of figures, see over.)

CAULOGLOSSUM TRANSVERSARIUM.

Fig. 6.

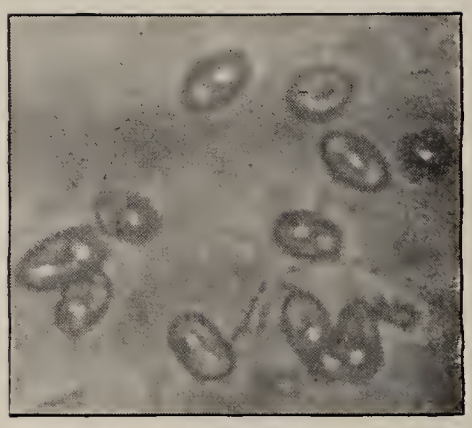


Fig. 7.

Explanation of Figures.

Figs. 1, 2, 3, 4, 5. Plants and sections, natural size. Fig. 6. Section (x five.) Fig. 7. Spores (x 1000.) Figs. 1, 3 and 6. Specimens from Florida from Roland Thaxter. Figs. 2, 4 and 5. Specimens from North Carolina in the Ellis collection.

CAULOGLOSSUM TRANSVERSARIUM.

Issued by C. G. LLOYD.

PLATE 13.

Fig. 1.

(Explanation of figures, see over.)

SECOTIUM ACUMINATUM.

Fig. 2.

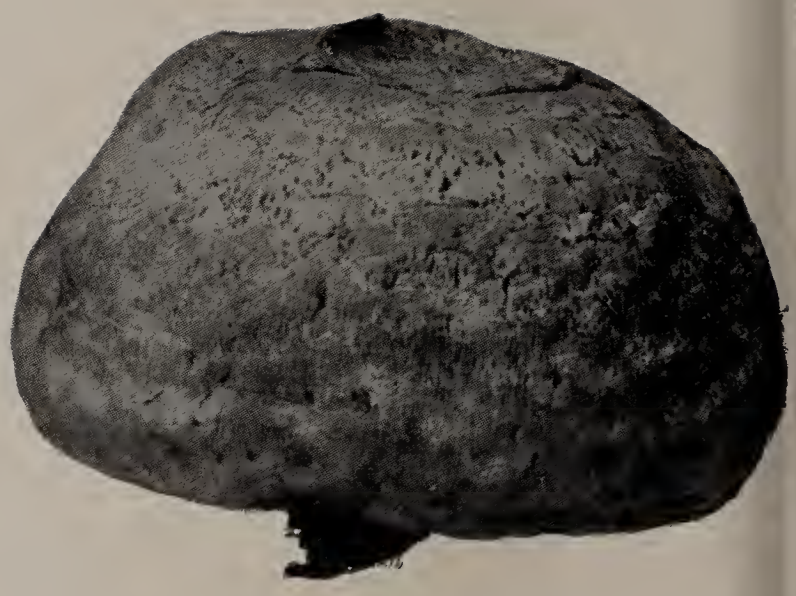


Fig3. .

Fig. 4.

Fig. 5.

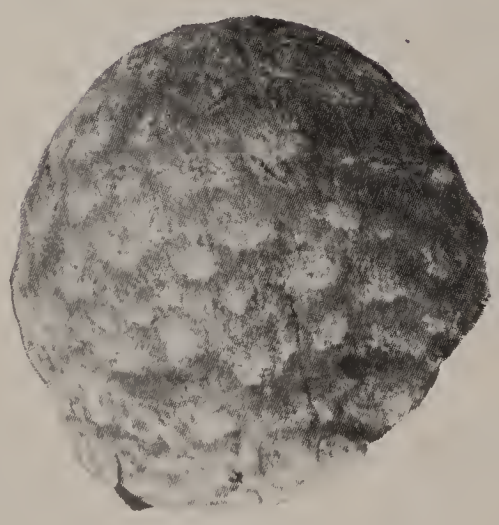


Fig. 6.

Fig. 7.

SECOTIUM ACUMINATUM.

(Explanation of figures, see over.)

Fig. 8.

Fig. 9.

Fig. 10.

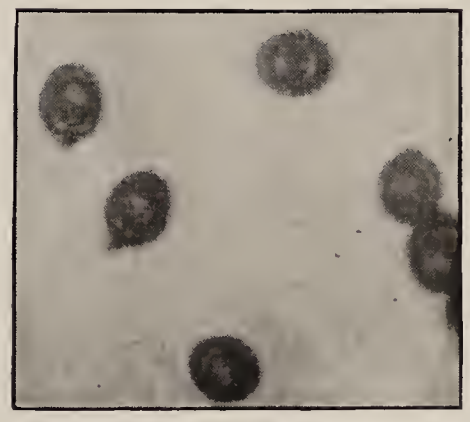


Fig. 11.

Explanation of Figures.

Figs. 1 to 10. Plants, natural size. Fig. 1. Unusually large specimen in Ellis's collection. Figs. 2 and 3. From C. V. Piper, Washington. Figs. 4 and 5. From Dr. H. L. True, Ohio. Figs. 6 and 7. Of the same collection from Kansas in the Ellis Herbarium. Fig. 8. From Dr. L. Hollos, Hungary. Fig. 9. Section of plant. Fig. 10. Plant from A. P. Morgan, Ohio. Fig. 11. Spores (x 1000.)

SECOTIUM ACUMINATUM.

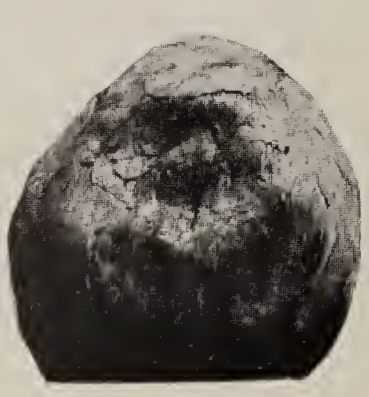


Fig. 12.

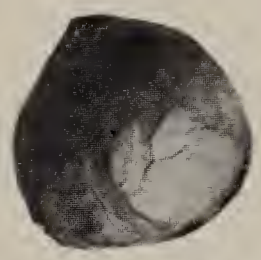


Fig. 13.

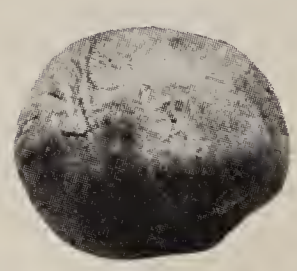


Fig. 14.

Fig. 15.

Fig. 16.

Explanation of Figures.

Figs. 12, 13 and 14. Plants, natural size. Fig. 15, Section. Fig. 16. Spores (x 1000.) All from E. P. Ely, Dallas, Texas. The bottom of figure 12 is cut off by limitation of plate.

SECOTIUM MACROSPORUM.

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PLATE 14.

Flg. 1.

Tig. 2.

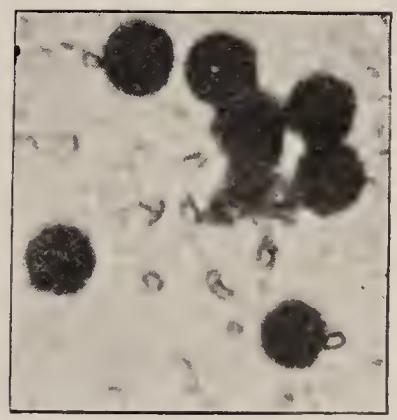


Fig. 3.

Explanation of Figures.

Fig. 1. Plant, natural size. Fig. 2. Capillitium (x 55.) Fig. 3. Spores (x 1000.) From specimen in the Ellis collection.

HYPOBLEMA LEPIDOPHORUM.

Issued by C. G. LLOYD.

PLATE 15.

Fig. 1.

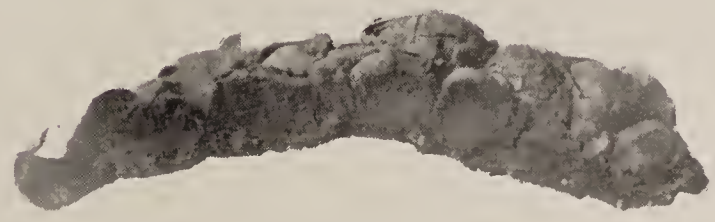


Fig. 2.

(Explanation of figures, see over.)

DIPLOCYSTIS WRIGHTII.

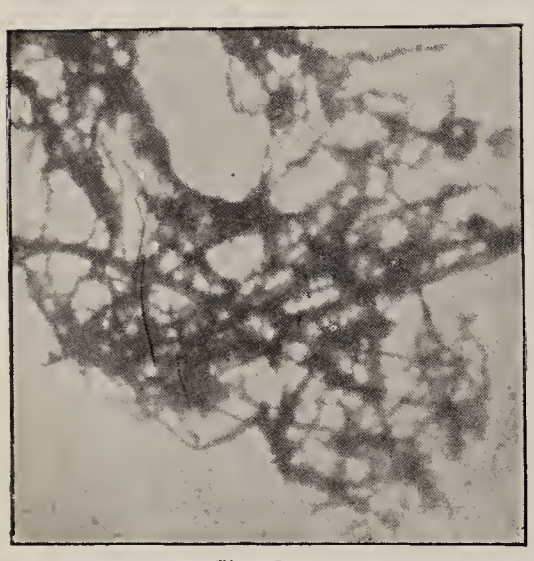
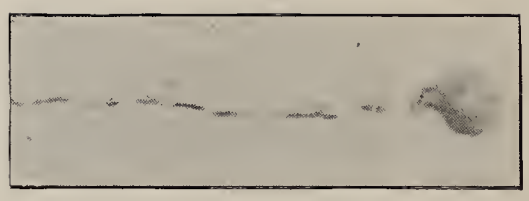


Fig. 3.



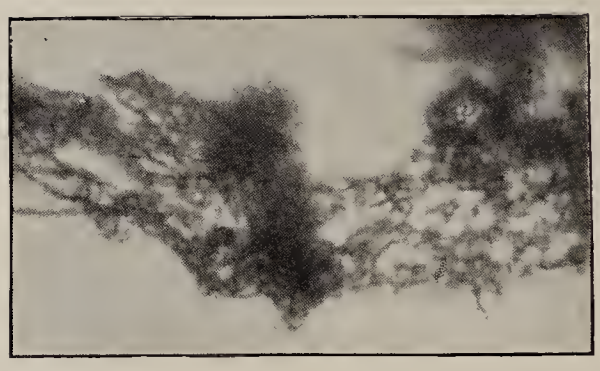


Fig. 4.

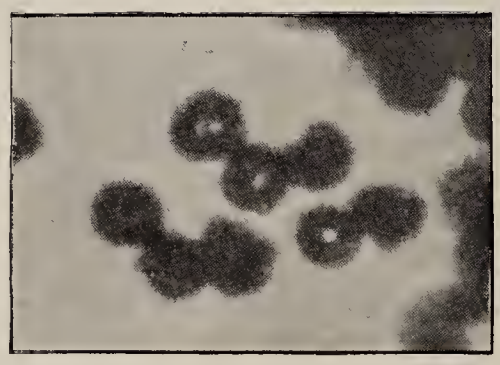


Fig. 5.

Explanation of Figures.

Fig. 1. A cluster of plants, natural size. Fig. 2. Section. Fig. 3. Capillitium (x 55.) Fig. 4. Capillitium shreds (x 1000.) Fig. 5. Spores (x 1000.) Specimens from L. J. K. Brace, Bahamas.

DIPLOCYSTIS WRIGHTII.

Issued by C. G. LLOYD.

PLATE 16.

Fig. 1.

Fig. 2.

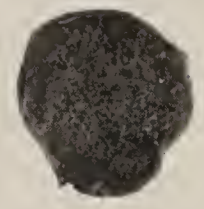


Fig. 3.

Fig. 4.

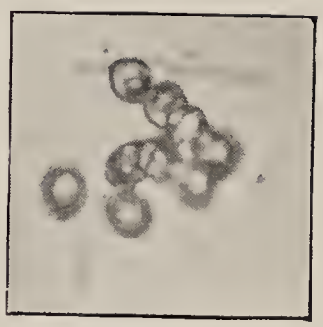


Fig. 5.

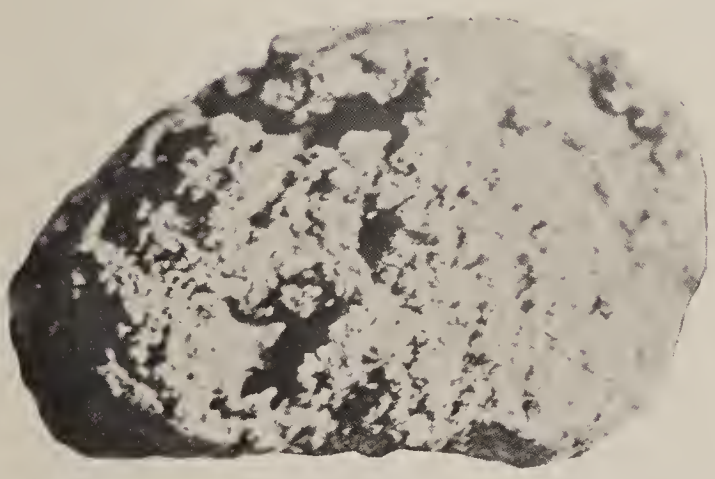


Fig. 6.

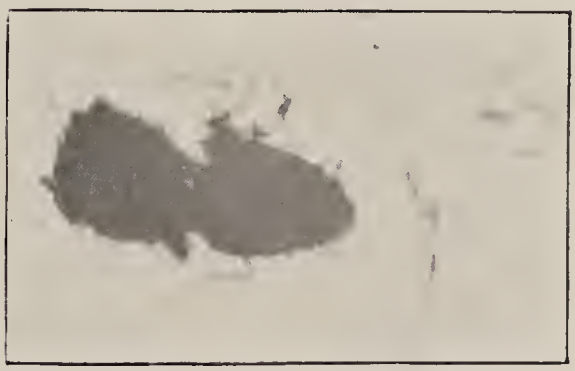


Fig. 7.

Explanation of Figures.

Figs. 1 to 4. Natural size. Fig. 2. Young. Figs. 1 and 4, Ripe. Fig. 3. Section. Fig. 5. Spores (x 1000.) Fig. 6. Section (x five.) Fig. 7. Peridioles (x 55.)

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PLATE 17

Fig. 1.

Fig. 2.

TRICHASTER MELANOCEPHALUS.

Fig. 3.

Explanation of Figures.

Figs. 1 and 2. Plants collected at Magdeburg, Germany, in herbarium of Dr. Magnus, Berlin. Fig. 3. Type specimen from Czerniaïev at Kew.

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PLATE 18

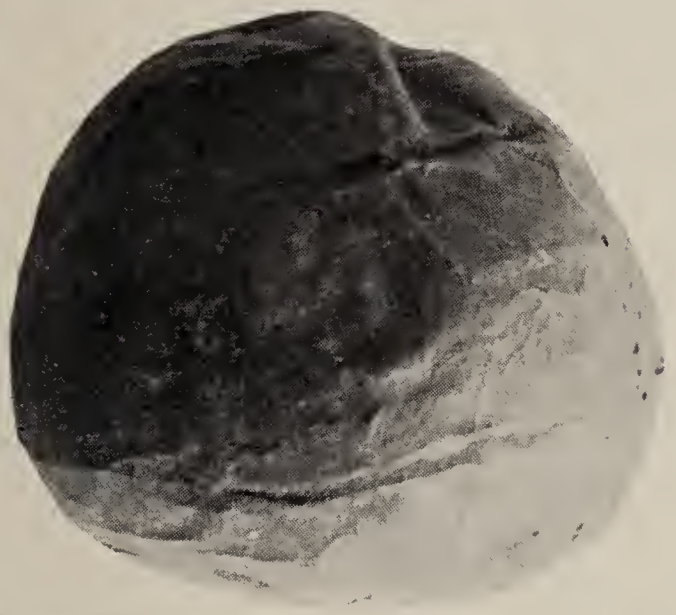

Fig. 1.

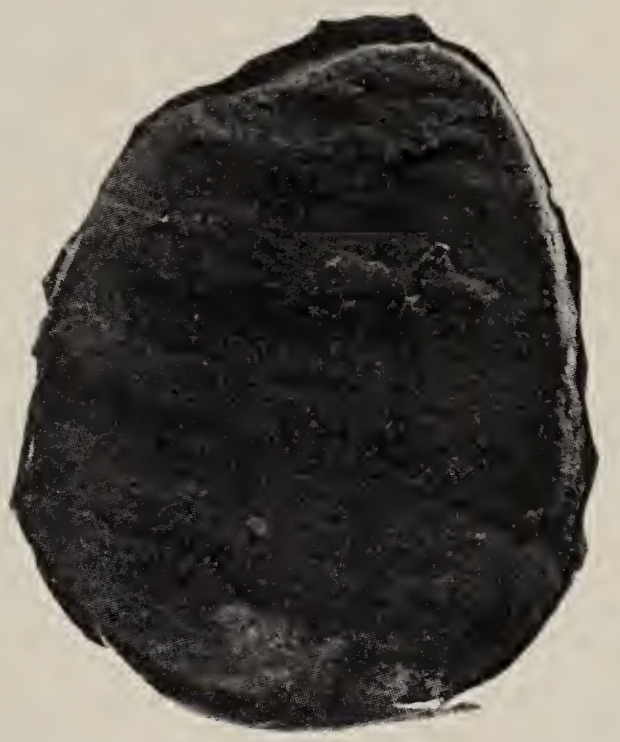

Fig. 2.

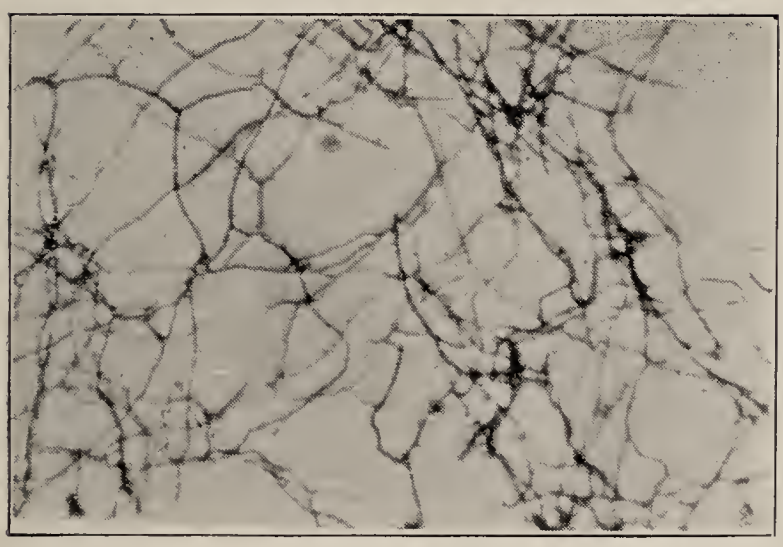

Fig. 3.

Fig. 4.

Explanation of Figures.

Fig. 1. Type specimen in Museum at Paris. Fig. 2. Section. Fig 3. Capillitium (x 100). Fig. 4. Spores (x 1000).

LANOPILA BICOLOR.

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PLATE 19

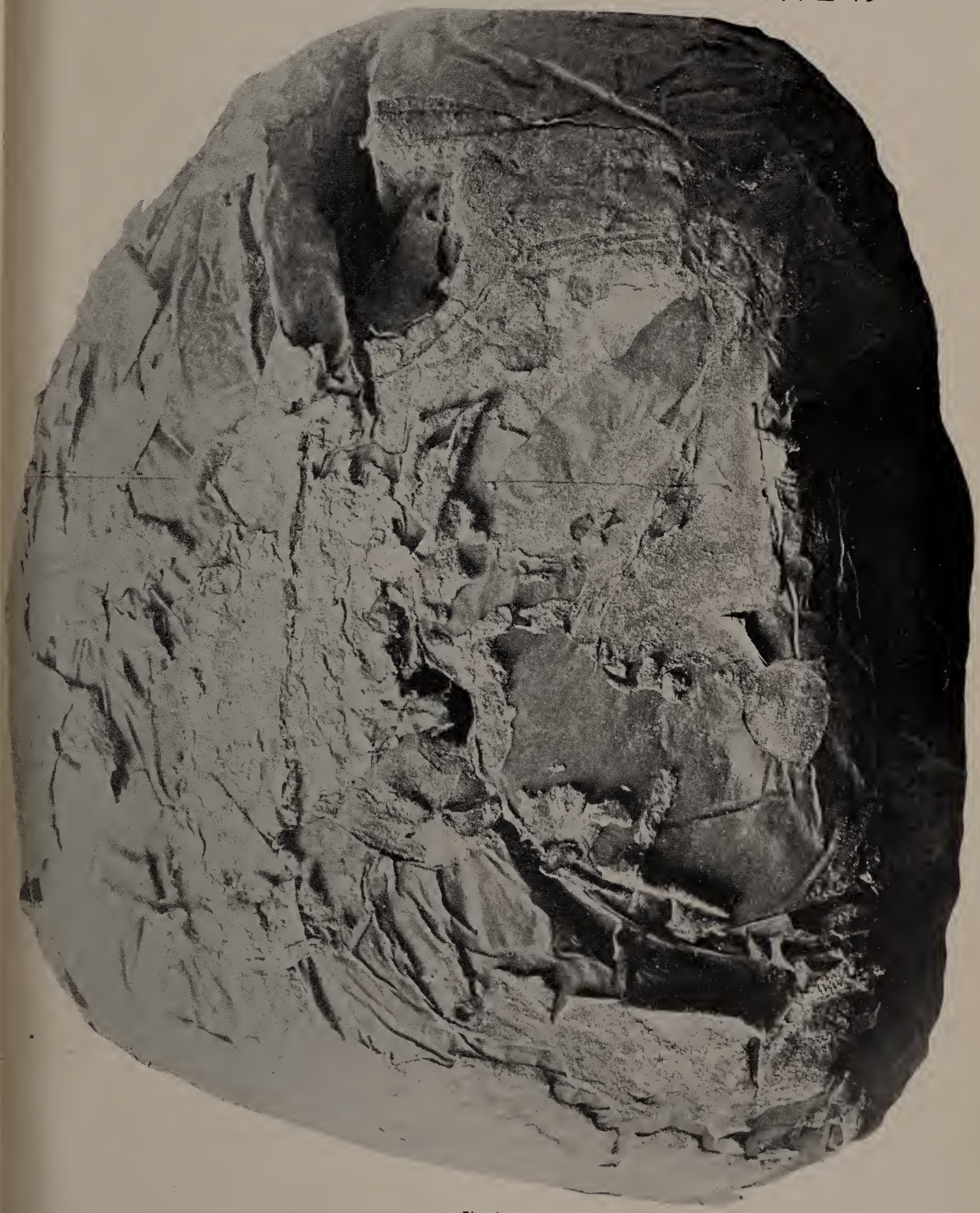

Fig. 1.

LASIOSPHAERA FENZLII.

Fig. 2.

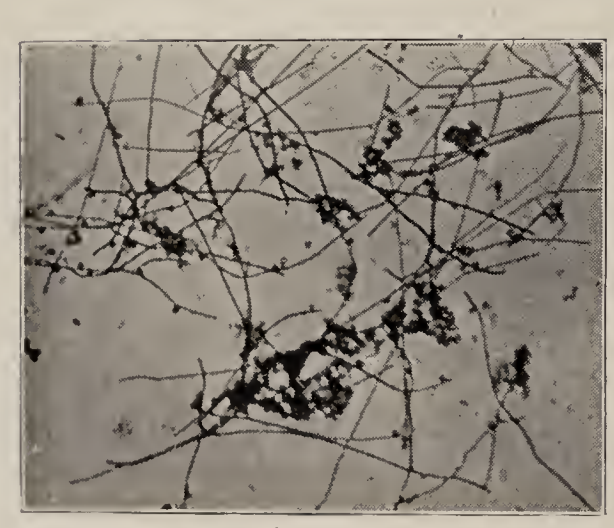

Fig. 3.

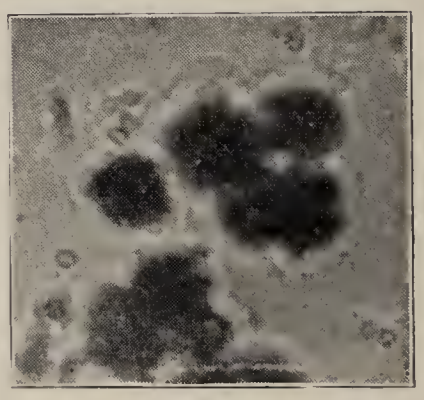

Fig. 4.

Explanation of Figures.

Fig. 1. A plant (reduced to one-quarter size) from Geo. H. Cave, British India. Fig. 2. The gleba mass (after the fall of the peridium) from Hugh F. MacMillan, Ceylon. Fig. 3. Capillitium (x 100). Fig. 4. Spores (x 1000).

LASIOSPHAERA FENZLII.

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PLATE 20

Fig. 1.

Fig. 2.

Fig. 3.

SCHIZOSTOMA LACERATUM.

Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

Explanation of Figures.

Figs. 1, 2, 3, 4, 5, 6. Plants in Museum at Berlin collected by Schweinfurth in Equatorial Africa. Fig. 7. Spores (x 1000). Fig. 8. Spores and Thread (x 1000). Fig. 9. Capillitium (x 100).

SCHIZOSTOMA LACERATUM.

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PLATE 21

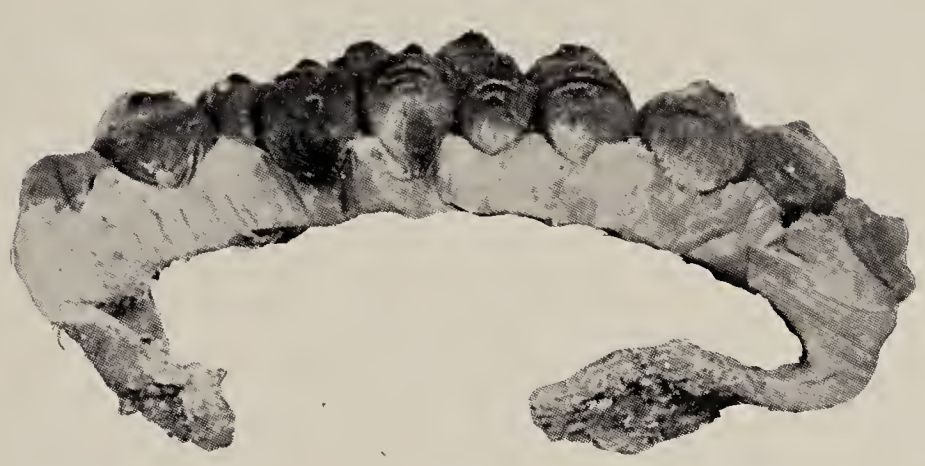

Fig. 1.

Fig. 2.

Fig. 3.

BROOMEIA CONGREGATA.

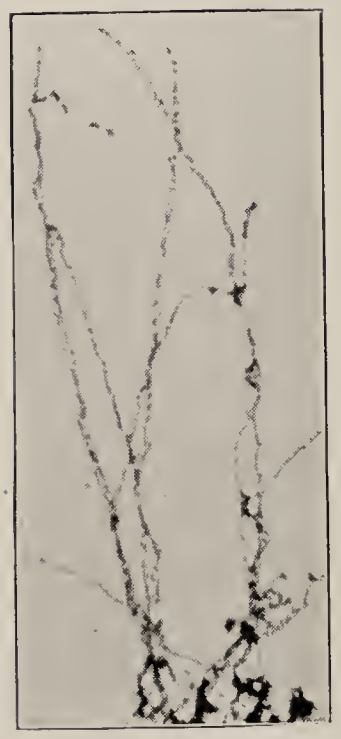

Fig. 4.

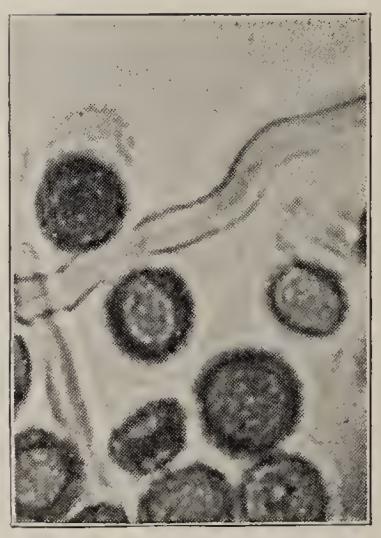

Fig. 5.

Explanation of Figures.

Figs. 1, 2, 3. Plants in Museum at Berlin collected by MacOwan in South Africa. Fig. 4. Capillitium (x 100). Fig. 5. Spores (x 1000).

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PLATE 22

Fig. 1.

BATTAREOPSIS ARTINI.

Fig. 2.

Fig. 3.

Fig 4.

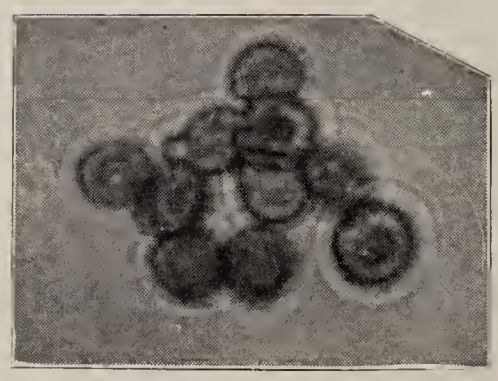


Fig. 5.

Explanation of Figures.

Fig 1. Stem. Fig. 2. Volva. Fig. 3. Cap. Fig. 4. Another view of same. Fig. 5. Spores (x 1000). All from type specimen in Museum at Berlin.

PLATE 23

Fig. 1.

GYROPHRAGMIUM DECIPIENS.

Fig. 2.

Fig. 3.

Explanation of Figures.

Fig. 1. A large specimen and one partly expanded. Fig. 2. A small plant (without volva). Fig. 3. Section. All from L. A. Greata, Los Angeles, California.

GYROPHRAGMIUM DECIPIENS.

Issued by C. G. LLOYD.

PLATE 24

Fig. 1.

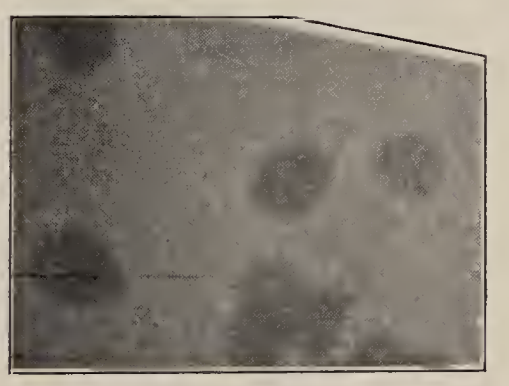


Fig. 2.

Explanation of Figures.

Fig. 1. Type at Kew. Fig. 2. Spores (x 1000).

GYROPHRAGMIUM INQUINANS.

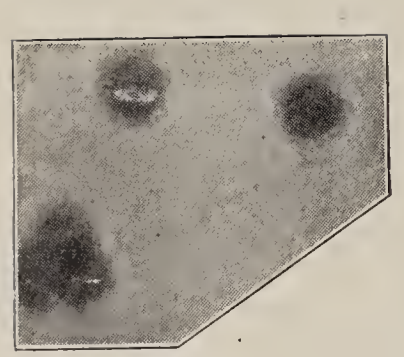
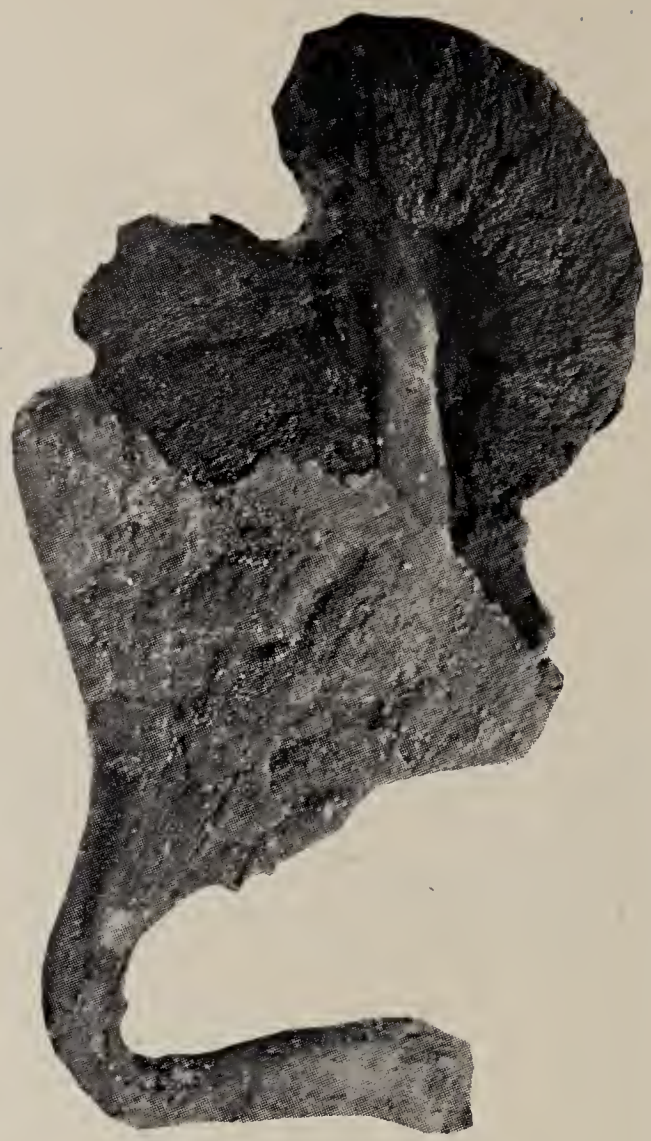


Fig. 3.



GYROPHRAGMIUM DELILEI.
(From type specimen in Museum at Paris)

Fig. 4.

Fig. 5.
GYROPHRAGMIUM TEXENSE.
(Specimen from W. H. Long, Jr., Texas.)

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PLATE 25

Fig. 1.

Fig. 2.

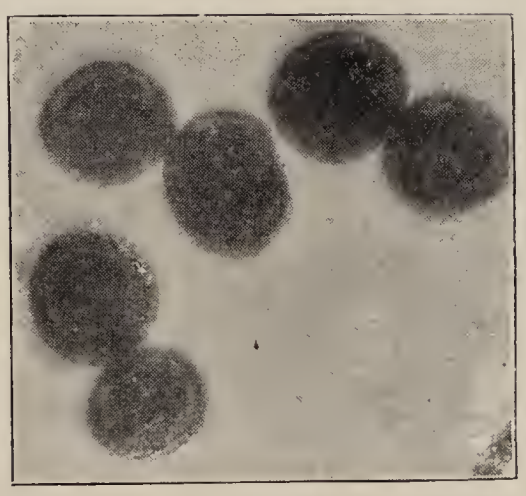

Fig. 3.

Explanation of Figures.

Fig. 1 and 2. Plants from R. T. Baker, Sydney, Australia. Figure 3. Spores (x 1000).

PODAXON AEGYPTIACUS.

Fig. 4.

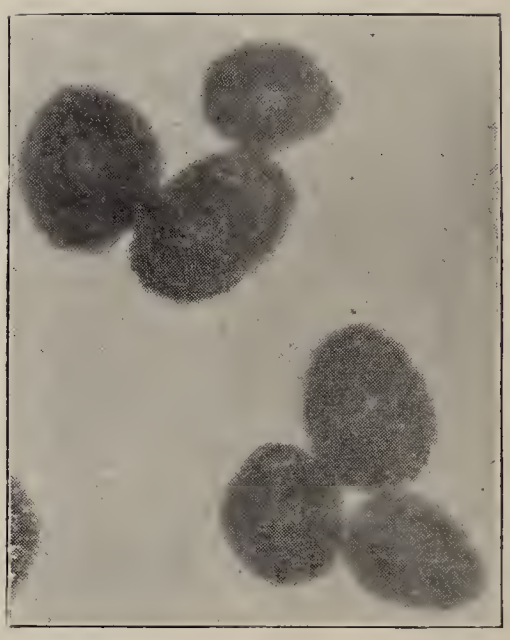

Fig. 5.

Explanation of Figures.

Fig. 4. Plant in Museum at Berlin. Figure 5. Spores (x 1000).

PODAXON MUELLERI.

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PLATE 26.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

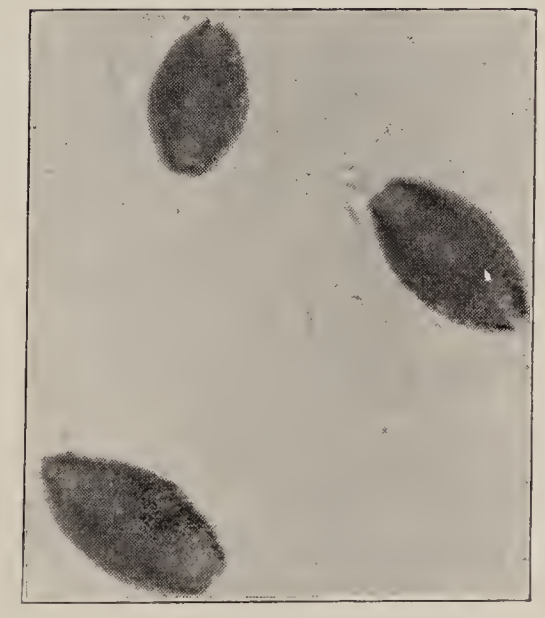

Fig. 6.

Explanation of Figures.

Figs. 1, 2, 3 and 4. Plants from Robt. Brown, New Zealand. Figure 5. A section enlarged fourfold. Figure 6. Spores (x 1000).

SECOTIUM ERYTHROCEPHALUM.

Fig. 7.

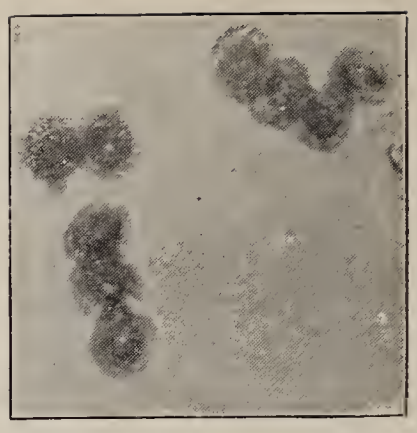

Fig. 8.

Explanation of Figures.

Fig. 7. Plant from W. H. Long, Jr. Texas, U. S, A. Fig. 8. Spores (x 1000).

SECOTIUM COARCTATUM.

Fig. 9.

Fig. 10.

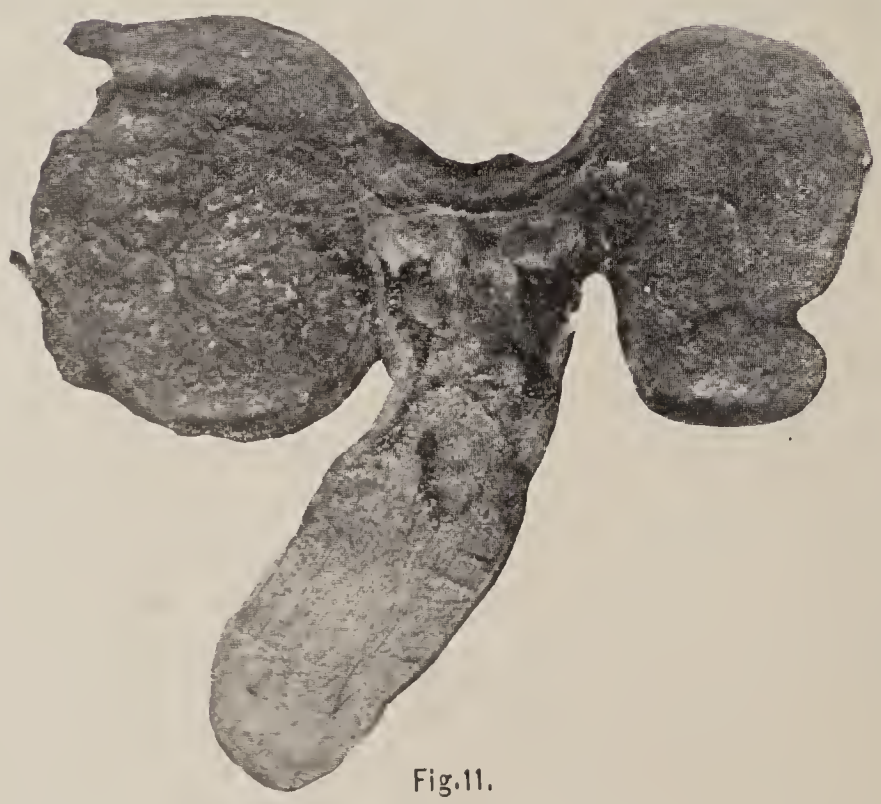

Fig.11.

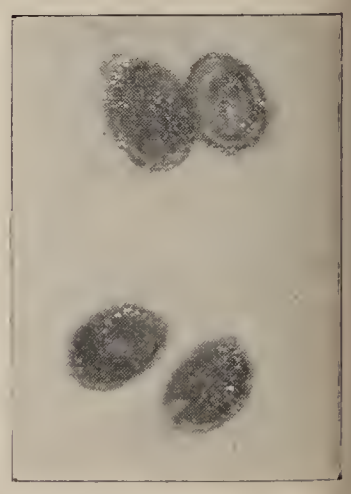

Fig. 12.

Explanation of Figures.

Fig. 9 and 10. Type specimens at Kew. Fig. 11. Section. Fig. 12. Spores (x 1000).

SECOTIUM MELANOSPORUM.

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PLATE 27

Fig 1.

Fig. 2.

Explanation of Figures.

Fig. 1. Plant from Algiers sent by A. Acloque, France. Fig. 2. Specimen at Kew from Australia. (Two inches of the stipe of the specimen is cut off from this figure).

PHELLORINA DELASTREI.

Fig 3.

Explanation of Figure.

Fig. 3. Type Specimen in Museum at Berlin.

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PLATE 28.

Fig. 1.

Explanation of Figure.

Fig. 1. Specimen from L. A. Greata, California.

BATTARREA PHALLOIDES.

Fig. 2.

Fig. 3.

Explanation of Figures.

Fig 2. Plant from L. G. Yates, California. Fig. 3. Section of same.

BATTARREA STEVENII.

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PLATE 29.

Fig. 1.

Fig. 2.

Explanation of Figures.

Fig. 1. Plant from New Caledonia, (from P. Hariot, Paris). Fig. 2. Plant from Walter Gill, Australia.

POLYSACCUM PISOCARPIUM

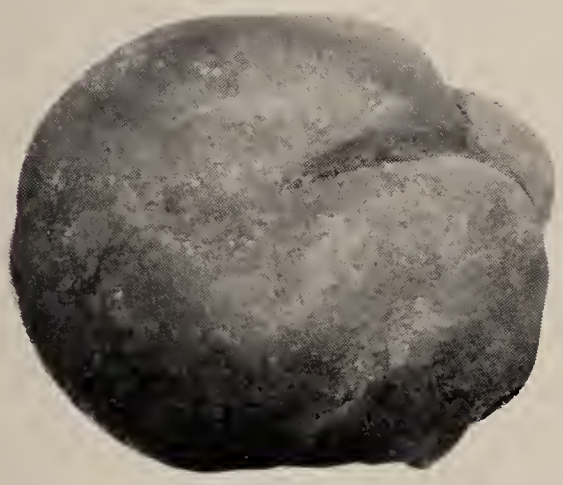

Fig. 5.

Fig. 6.

Explanation of Figures.

Fig. 5. Plant from Saxony in Museum at Berlin. Fig. 6. Plant from J. T. Paul, Australia.

POLYSACCUM TUBEROSUM.

Fig. 3.

Fig. 4.

Explanation of Figures.

Fig. 3. Plant from L. G. Yates, California. Fig. 4. Plant from R. T. Baker, Australia.

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PLATE 30

Fig. 1.

Fig 2.

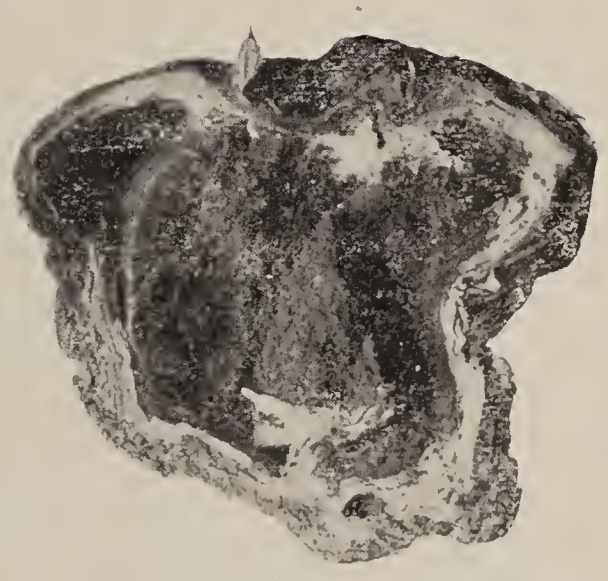

Fig. 3.

Explanation of Figures.

Fig. 1. Mature specimen from A. P. Morgan, Ohio. Fig. 2. Young (unopened) specimen from Simon Davis, Massachusetts. Fig. 3. Section of same.

SCLERODERMA GEASTER.

Fig. 4.

Fig. 5.

Fig 6.

Explanation of Figures.

Fig. 4. Unopened plant from J. B. Ellis, New Jersey. Fig. 5. Same opened. Fig. 6. Specimen from W. R. Guilfoyle, Australia.

SCLERODERMA FLAVIDUM.

Fig. 1.

Explanation of Figure.

Fig. 1. Specimen from Steve C. Stuntz, Wisconsin.

SCLERODERMA CEPA.

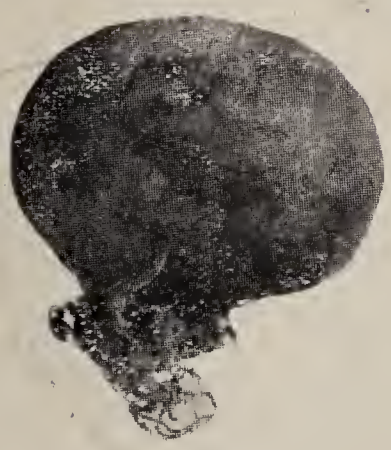

Fig. 2.

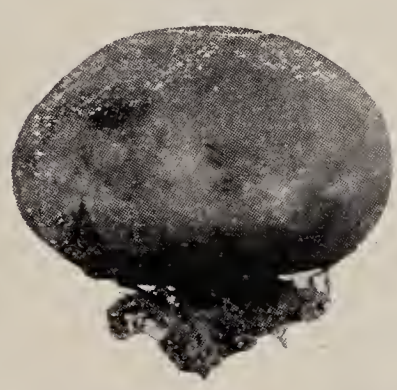

Fig. 3.

Fig. 4.

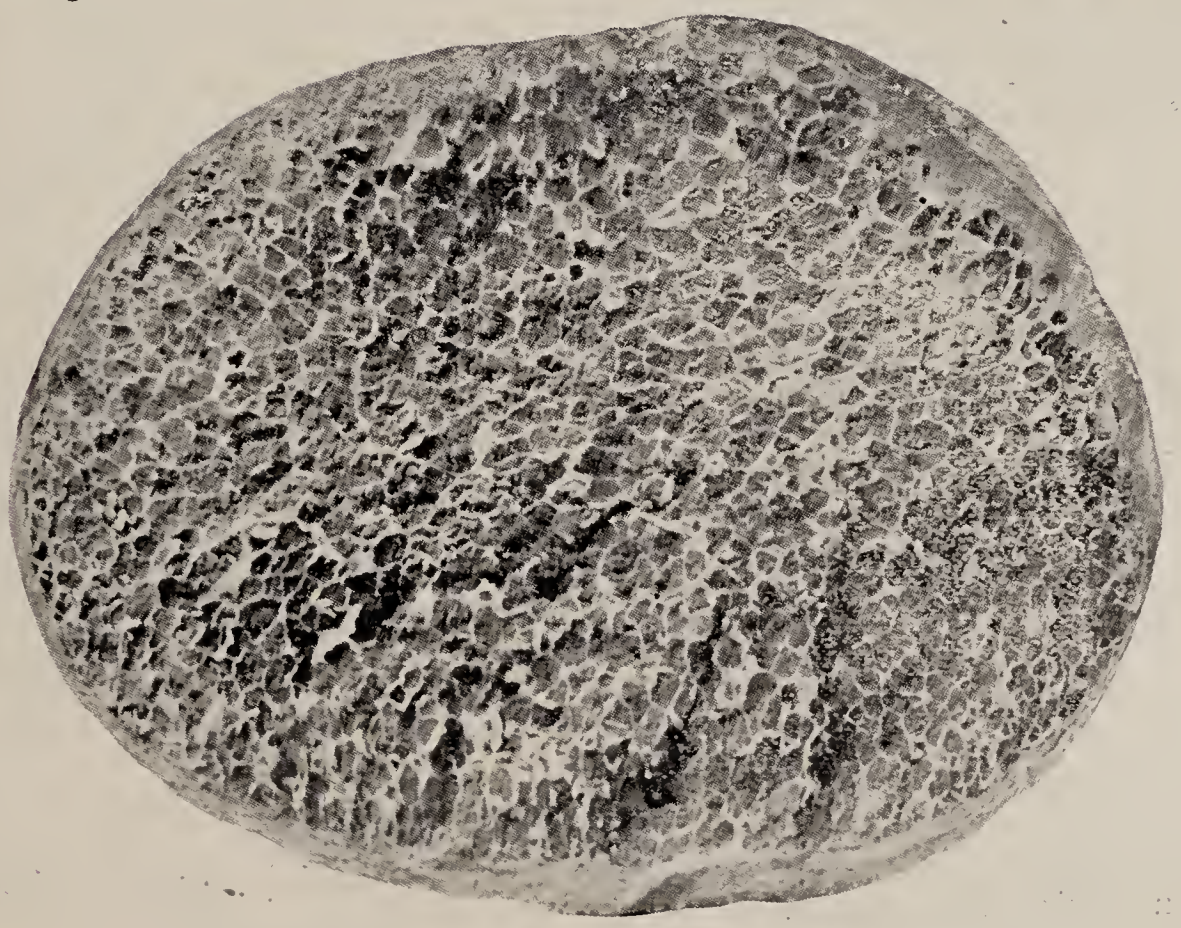

Fig. 5.

Explanation of Figures.

Fig. 2 and 3. Plant collected at Cincinnati. Fig. 4. Section of same. Fig. 5. Section enlarged threefold to show the permanent cells.

SCLERODERMA TEXENSE

Fig. 6.

Fig. 7.

Explanation of Figures

Fig. 6 and 7. Plants from Dr. Wm. Herbst, Pennsylvania.

SCLERODERMA AURANTIACUM.

Fig. 9.

Fig. 8.

Explanation of Figures.

Fig. 8. Plant from Charles Crossland, England. Fig. 9. Plant from Simon Davis, Massachusetts.

SCLERODERMA VERRUCOSUM.

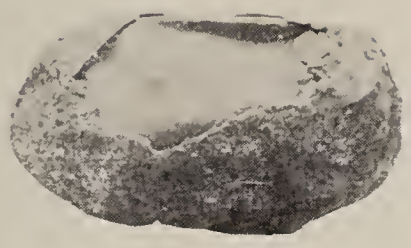

Fig. 1.

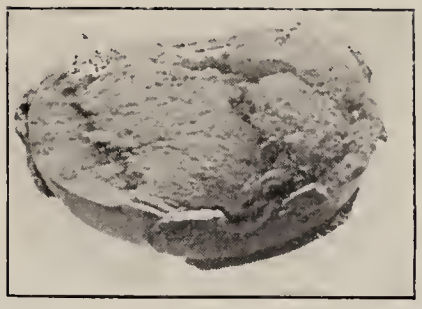

Fig. 2.

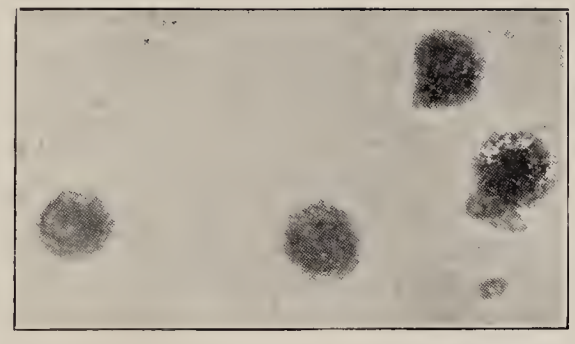

Fig. 3.

Explanation of Figures.

Fig. 1. Specimen at Kew, Fig. 2. Section of same. Fig. 3. Spores (x 1000).

CATASTOMA HYPOGAEUM.

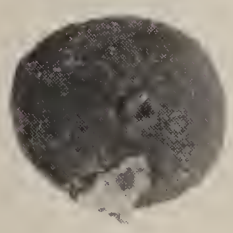

Fig. 4.

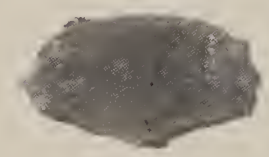

Fig. 5.

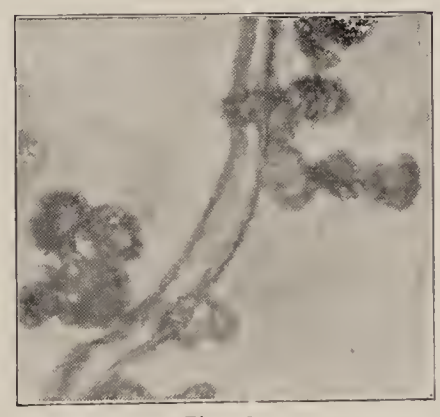

Fig. 6.

Explanation of Figures.

Fig. 4. Specimen from R. T. Baker, Australia. Fig. 5. Section. Fig. 6. Spore (x 1000).

CATASTOMA ANOMALUM.

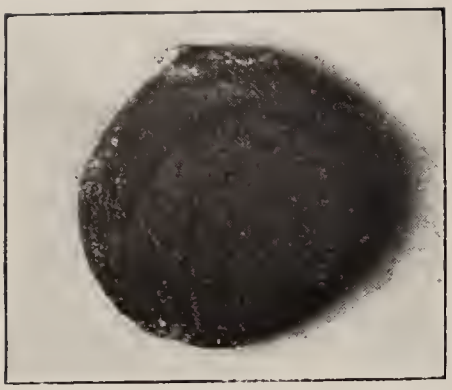

Fig. 7.

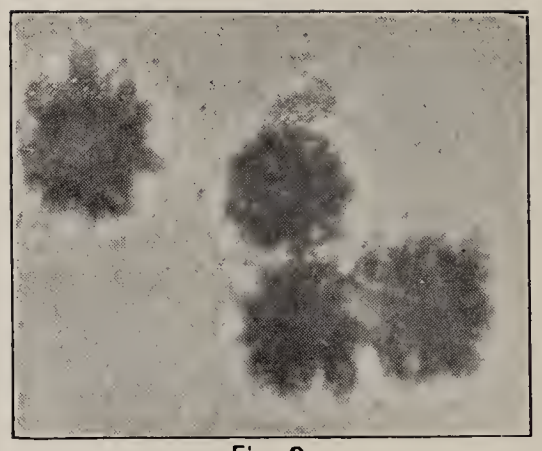

Fig. 8.

Explanation of Figures.

Fig. 7. Type Specimen at Kew. Fig. 8. Spores (x 1000).

CATASTOMA MUELLERI.

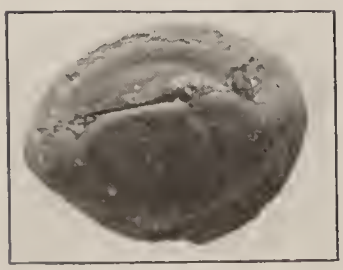

Fig. 9.

Fig. 10.

Fig. 11.

Explanation of Figures.

Fig. 9. Type specimen at Kew. Fig. 10. Section. Fig. 11. Spores (x 1000).

CATASTOMA HYALOTHRIX.

ssued by C. G. LLOYD.

PLATE 33.

Fig. 1.

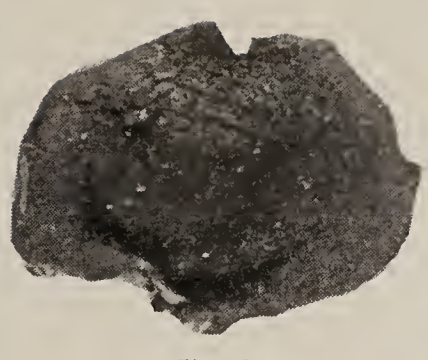

Fig. 2.

Fig. 3.

Fig. 4.

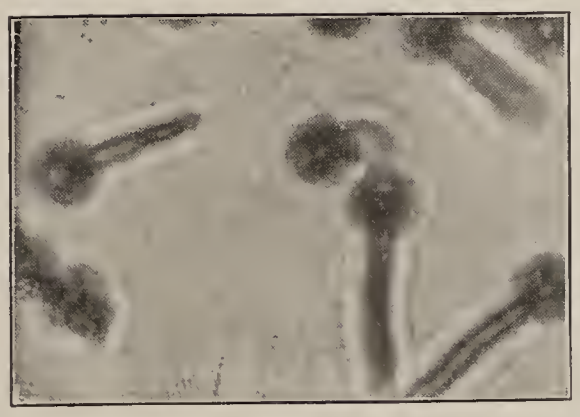

Fig. 5.

Explanation of Figures.

Specimens from J. T. Paul, Australia. Fig. 5. Spores (x 1000).

BOVISTELLA AUSTRALIANA.

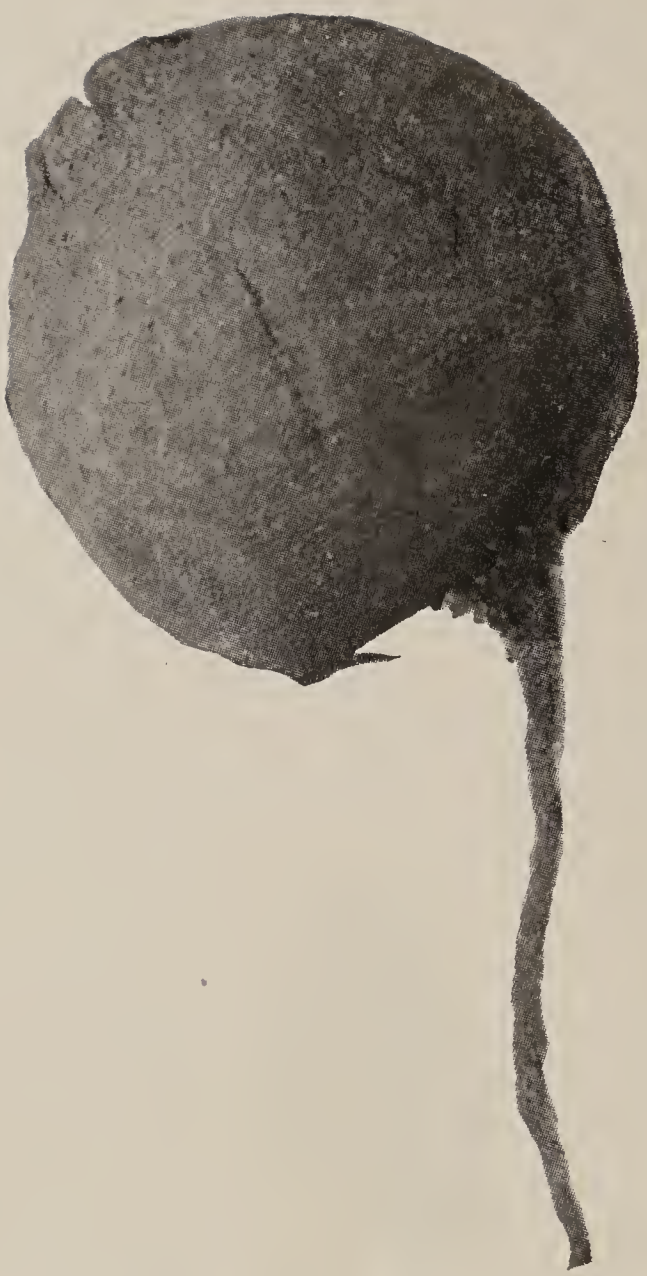

Fig. 6.

Fig. 7.

Fig. 8.

Fig. 10.

Fig. 9.

Explanation of Figures.

Fig. 7. Type in Museum at Paris. Fig. 8 & 9. Specimens from W. W. Watts Sydney, Australia. Fig. 6. Plant enlarged 4 times. Fig. 10. Capillitium (x 100).

BOVISTELLA ASPERA.

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PLATE 34.

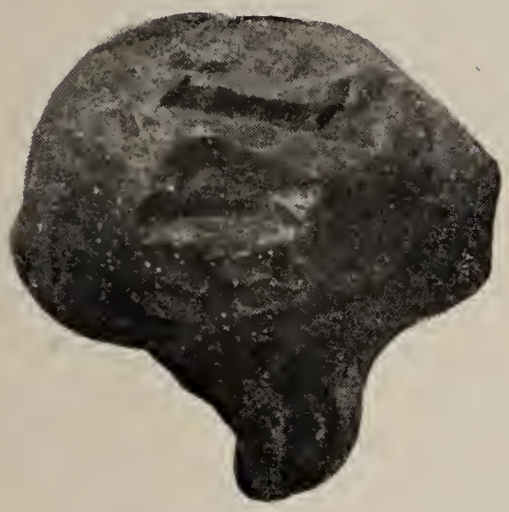

Fig. 1.

Fig. 2.

Fig. 3.

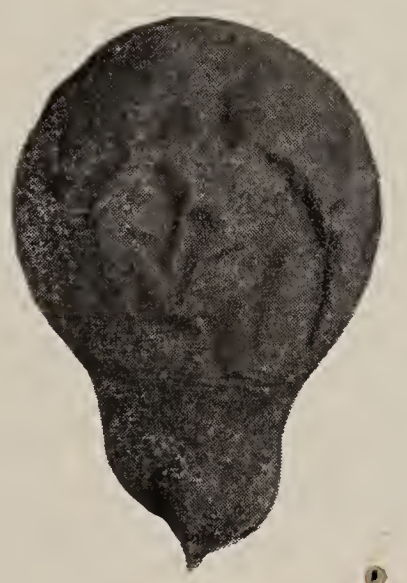

Fig. 4.

Fig. 5.

Fig. 6.

Explanation of Figures.

Fig. 1 and 2. Plants from W. R. Guilfoyle, Australia. Fig. 3, 4, 5 and 6. Plants from Miss Jessie Dunn, New Zealand.

LYCOPERDON POLYMORPHUM.

Fig. 7.

Fig. 8.

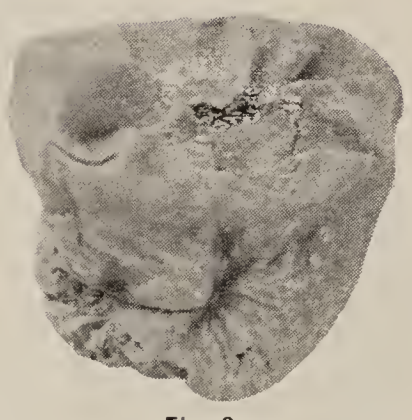

Fig. 9.

Fig. 10.

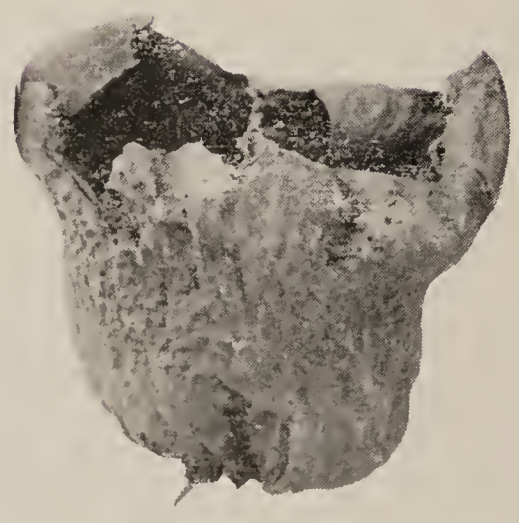

Fig. 11.

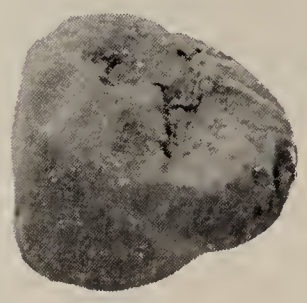

Fig. 12.

Explanation of Figures.

Fig. 7. Young plant with cortex. Fig. 8, 9, 10, 11 and 12. Mature plants Fig. 10. Section. All from Robert Brown, New Zealand.

LYCOPERDON PRATENSE.

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PLATE 35.

Fig. 1.

Explanation of Figure.

Mature plant from vicinity of Cincinnati, Ohio.

CALVATIA LILACINA.

Fig. 2.

Fig. 3.

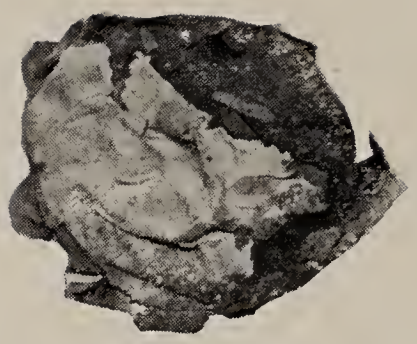

Fig. 4.

Explanation of Figures.

Fig. 2. Specimen from J. G. O. Tepper, Australia. Fig. 3. Plant in Museum at Berlin. Collected by Dr. Hennings, near Berlin. Fig. 4. Plant from Dr. Hollos, Hungary.

CALVATIA CANDIDA.

Fig. 5.

Explanation of Figure.

Fig. 5. From type specimen at Kew.

CALVATIA OLIVACEA.

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PLATE 36.

Fig. 1.

Fig. 2.

CALVATIA CAELATA.

Fig. 3.

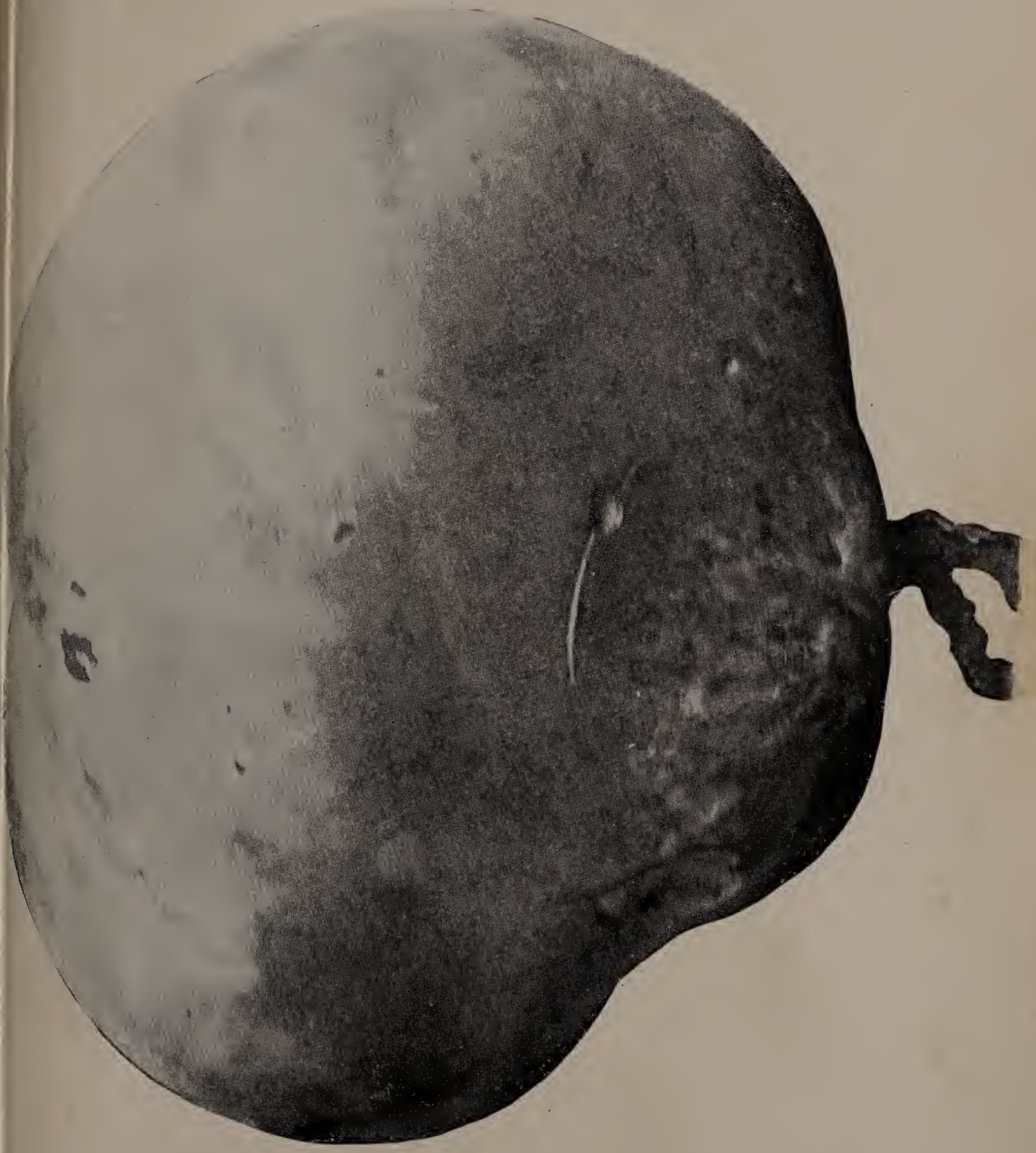
Fig. 4.

Fig. 1. Plant from T. de Aranzadi, Spain. Fig. 2. Plant from E. Bartholomew, Kansas. Fig. 3. Plant from Robert Brown, New Zealand. Fig. 4. Plant from C. V. Piper, (state of) Washington.

CALVATIA CAELATA.

Issued by C. G. LLOYD.

PLATE 37.



Explanation of Figure.

A small plant collected near Cincinnati, Ohio.

CALVATIA GIGANTEA.

PLATE 38.

Fig. 1.

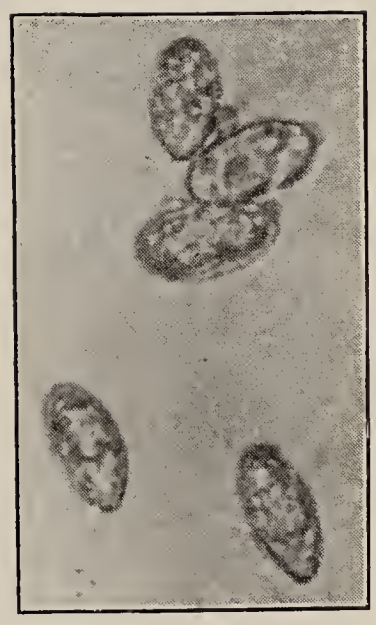


Fig. 2.

Explanation of Figures.

Fig. 1. Type specimen at Kew. Fig. 2. Spores (x 1000).

CASTOREUM RADICATUS. *m.*

Issued by C. G. LLOYD.

PLATE 39.

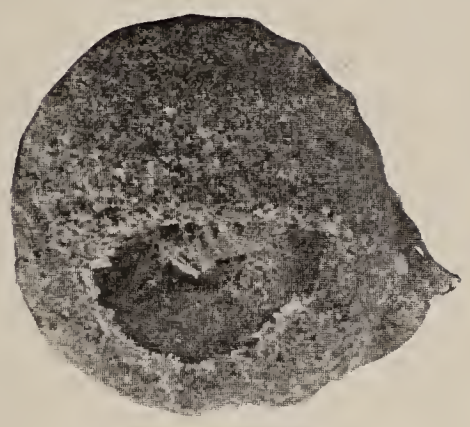


Fig. 1.

Fig. 2.

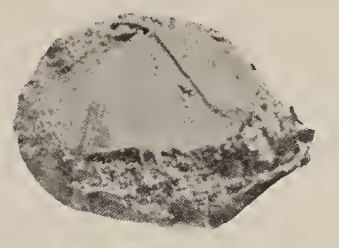


Fig. 3.

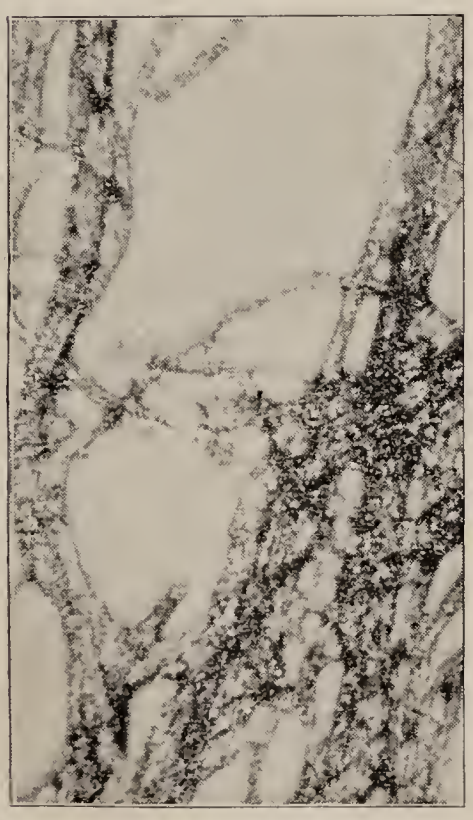


Fig. 4.

Fig. 5.

Explanation of Figures.

Fig. 1. Plant in exoperidium. Fig. 2 & 3. Section of endoperidium, showing core. Fig. 4. Capillitium (x 100). Fig. 5. Spores (x 1000). All from types at Kew.

MESOPHELLIA ARENARIA.